RAFFERTY-ALAMEDA PROJECT

ENVIRONMENTAL IMPACT STATEMENT

Souris Basin
Development
Authority

CHAPTER 15

WILDLIFE

RAFFERTY/ALAMEDA ENVIRONMENTAL IMPACT STATEMENT

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WILDLIFE

BACKGROUND

As discussed in the Project Description, consideration and discussion of a variety of watershed management schemes for the Souris River Basin has continued over a period of decades. A specific multiple objective project development, on the scale of the current Rafferty/Alameda Project, was not economically feasible until recently when a combination of circumstances developed; these circumstances include the United States' interest in flood control for the City of Minot and the need for cooling water for the proposed Shand Power Station. The American interest in the Rafferty/Alameda Project is very recent; their financial investment in the project creates a window of opportunity of which the Saskatchewan Government has chosen to take advantage. Cost has been a critical factor throughout the history of proposed dams in the Estevan area and if this current opportunity is lost, it may be decades before another occurs.

Multiple objective water management projects of this magnitude normally require many years of assessment from initial conception to completion. The U.S. Army Corps of Engineers takes, on average, 18 years to obtain background data, to develop all pre-engineering studies and designs and to complete construction of major projects (U.S. Army Corps of Engineers, St. Paul District, personal communication). The Organization of Economic Co-operation and Development (OECD 1983) has similarly recognized the extended period of time required to plan and undertake complex, multi-purpose water management projects.

In the Canadian context, the Province of Ontario has indicated a shorter period (5 years) in order to complete baseline studies in advance of the commencement of construction (Pope 1983).

The present opportunity afforded by the current circumstances of Saskatchewan Power Corporation requiring water for the Shand Power Station by 1991 and the U.S. Government desiring flood control for Minot, permits neither 5 years of exhaustive data collection nor 18 years of reflective study. The Souris Basin Development Authority therefore has been compelled to utilize existing reliable wildlife baseline information, wherever available, and to supplement such data with current field surveys. Unfortunately, some data collection has not been physically possible due to constraints beyond the control of the Authority. For example, it has not been possible to undertake up-to-date, reliable surveys of white-tailed deer (**Odocoileus virginianus**) which frequent the Souris River Valley or its major tributaries under severe winter conditions. The winter snow conditions necessary for these surveys in the Study Area (i.e. complete snow cover) have not occurred for the past two winters, thus making planned aerial surveys impossible to conduct. Further, it cannot be predicted with any degree of certainty when such a winter will occur again.

Another major area of concern relates to the ecology of the Sharp-tailed Grouse (**Tympanuchus phasianellus**). Current knowledge of the significance of the complex Souris River Valley topography and vegetation relative to the life history requirements of Sharp-tailed Grouse remains inadequately researched, understood or documented. Provincial wildlife biologists have been unable to undertake the required long-term ecological research to advance this knowledge, hence the Authority was, and is, at a significant disadvantage when attempting to determine potential negative impacts on such species and existing or future populations.

It is a well known and documented fact, however, that wildlife productivity, health and populations in general respond directly to key environmental factors such as climate and suitable habitat for food and shelter. Populations of various species can flourish under ideal habitat conditions or they can decline drastically under severely adverse conditions. Populations therefore fluctuate naturally within a high and low range generally reflecting the quality and quantity of suitable habitat.

In this vein, recent drought conditions in southeastern Saskatchewan have altered stream flows in the Souris River and its tributaries to a level below average. As a result, waterfowl productivity has been naturally restricted and competition from cattle grazing has been prevalent in certain reaches of the river. Attempts at population surveys can be significantly influenced by these short-term climatic conditions. Habitat evaluation methodologies therefore, can be more reliable over the long-term.

In selecting a reliable and valid methodology to quantify current wildlife utilization, circumstances limited the Authority to two basic options: either undertake detailed population surveys and relate those populations to the current available habitat which would be affected by the Project; or undertake a wildlife habitat inventory to ascertain quality and quantity, then evaluate that habitat relative to its potential to sustain wildlife populations in the area.

The inadequacy of current wildlife population data, such as for white-tailed deer, rendered the first option questionable in terms of reliability and value of results. Yet, with respect to the current, rather limited state of knowledge of the ecology of Sharp-tailed Grouse, it was agreed that neither option could yield completely reliable results.

The most effective approach to wildlife mitigation of a project such as this necessitated consideration of a number of factors: availability of current information; reliability of information; time constraints; financial constraints and long-term objectives. After consultation with wildlife biology specialists, the Authority selected a habitat-based impact assessment approach as having the most satisfactory capacity to provide useful material for this Project, within the constraints noted above.

Based upon the immediate need to proceed with the Environmental Impact Assessment, the Authority opted to undertake an inventory and evaluation of the habitat which would be directly affected by the Project while simultaneously committing itself to a mitigation program aimed at replacement and enhancement of critical wildlife habitat. The Authority recognizes the need to augment current knowledge of the ecology of certain wildlife species such as white-tailed deer, Sharp-tailed Grouse, Ferruginous Hawk (**Buteo regalis**) and Burrowing Owl (**Athene cunicularia**) and, to that end, will undertake and support further necessary research in co-operation with provincial wildlife biologists. With adequate climatic conditions, the Authority believes that the necessary surveys can be carried out in advance of the completion of the construction of the Rafferty Dam and inundation of critical and important habitat. Such research will improve the understanding of the relationships between habitat type and quality, and wildlife species and population fluctuations. Knowledge gained from such research may be applicable not only to the Rafferty and Alameda Project Areas but to other parts of the province such as surrounding *Lake Diefenbaker*, as well as future water management projects in Saskatchewan or elsewhere in the Canadian Prairies.

The Authority believes that it is 'breaking new ground' in Saskatchewan with its commitments to habitat replacement, habitat enhancement on islands, wetland creation and financial support for further and ongoing wildlife ecology research. It may not be completely appropriate to directly compare these efforts and commitments to previous large multiple-objective water management projects (Squaw Rapids and Tobin Lake, and Lake Diefenbaker), or to much smaller projects such as the creation of the Echo Valley Provincial Park core area from the fish spawning areas and wetlands between Echo and Pasqua Lakes, however the Authority believes it is taking a responsible position toward attempting to mitigate the identified negative impacts of the Project. The Environmental Impact Assessment process serves well to encourage integrated resource planning and design of mitigation components.

In an ideal situation, all the correct questions are formulated and all the answers obtained before proceeding with any project. In light of the fact that conditions are seldom ideal, projects are often initiated and proceed in full recognition that additional baseline information will be necessary in order to establish a substantive and reliable monitoring program, resulting in detailed long-term mitigation efforts. It is frequently not possible to predict or, to plan for all potentialities. Often, it is most productive to evolve specific details utilizing ongoing research and new technologies. An ongoing monitoring program recognizes the need to make adjustments to initial plans, recognizing and incorporating new information as it becomes available.

As discussed in the concluding Mitigation and Enhancement Section, the Authority fully recognizes the significance of the critical wildlife habitat in and adjacent to the Souris River Valley and is committed to mitigation of losses to the extent physically and fiscally possible. The mitigation program proposed by the Authority is one of the most extensive wildlife habitat replacement efforts that has been undertaken in Saskatchewan and is a responsible attempt to ameliorate many of the negative impacts of the Project. As well, the information obtained from the studies to which the Authority is committed will significantly improve the level of information and knowledge which has been accumulated to date within the Study Area.

ENVIRONMENTAL SETTING

1 INTRODUCTION

Wildlife constitutes a vital component of the natural resources of any rural region in Canada. Wildlife is important to the lifestyle of many Canadians for both consumptive and non-consumptive recreation, and sometimes for a direct source of income. Ecologically, the abundance and diversity of wildlife species can also be indicative of overall environmental quality.

Southern Saskatchewan supports a diverse community of birds, mammals, reptiles and amphibians, either as residents or seasonal migrants. These are representative of a mixed grass prairie environment that has been extensively altered by agricultural activities and other cultural developments. The Study Area (Saskatchewan Census Divisions One and Two) contains substantial areas of suitable habitat (particularly for birds and mammals), most of which will not be inundated by the proposed Rafferty/Alameda Reservoirs. Where inundation will occur, the potential impact of the proposed reservoirs and associated works must be considered in balancing the project costs and benefits to the region and the Province of Saskatchewan.

Identification of the wildlife resources in the vicinity of the proposed Rafferty Reservoir Project Area was accomplished through consultation with individuals familiar with the region, review of published information pertaining to the region, utilization of reference materials on the fauna of Saskatchewan and field investigations. Major sources of information for compiling the environmental setting included Blood **et al**. (1976), Flory (1981), Stelfox (1979), Noble and Flory (1978), Souris River Basin Study Report (1978) and existing government files supplied through personal contact with members of the Wildlife Branch, Saskatchewan Parks, Recreation and Culture.

Field investigations pertaining to the proposed Rafferty Reservoir consisted of surveys in the summer and fall of 1984 and the winter and spring of 1985. Surveys were designed to assess waterfowl and upland game bird production, waterfowl staging and ungulate utilization during the winter. Winters have been too mild to warrant further ungulate surveys in 1986 and 1987.

A preliminary evaluation of that portion of Moose Mountain Creek which would be impacted by the proposed Alameda Reservoir was achieved through literature search, air photo interpretation and ground reconnaissance of portions of the proposed reservoir in January, 1986 and April, 1987. The field reconnaissance was not conducted to collect baseline data but to assist in the professional judgment of the quality of wildlife habitat associated with the reservoir area. Due to the paucity of baseline information for the Alameda Reservoir, and the fact that additional baseline field studies are ongoing in 1987 and white-tailed deer aerial surveys are projected for January, 1988, separate documentation will be presented to Saskatchewan Environment for the Alameda Reservoir when it becomes available.

2 HISTORICAL REVIEW OF WILDLIFE HABITAT

Availability, type and productivity of wildlife habitat is dictated by many factors including topography, aspect, drainage, climate, soils and land use. Topography and land use have been the major influences on habitat availability within the Study Area.

Prior to settlement and land cultivation, the area was characterized by extensive, open stretches of native prairie. This is supported by the extensive occurrence of dark brown and black chernozemic soils which developed their rich organic content from the fibrous root systems of grasses. Frequent prairie fires restricted woody vegetation to the slopes and bottoms of river valleys as well as the more moist soils along drainages and in deeply eroded coulees. Even low shrubs like rose, silverberry and snowberry, which are an integral component of most native grassland areas today, were restricted to moist depressions and sheltered sites which had escaped fires.

Explorers in the late 1850's found the plains largely barren of any woody vegetation (Hind 1859, Spry 1963). When the first settlers arrived in the late 1800's and early 1900's, they found a similar natural vegetation pattern.

By 1920, agricultural settlement in the southeast was sufficient to largely control and restrict prairie fires and the invasion of native grasslands by woody vegetation and aspen commenced, primarily in the Black Soil Zone where soil moisture conditions were more favorable. During the period when fires were curtailed and grazing pressures were minimal (after the extirpation of the bison [**Bison bison**]), native prairie vegetation became more dense and luxuriant, favoring greater soil moisture conservation and enabling more invasion by moisture-loving species.

In the decades following settlement, most areas suitable for cultivation were cleared and cultivated. Very little native grassland vegetation remains (less than 10% of the area), compared to over 80% at the turn of the century (Stelfox 1979).

3 HISTORICAL REVIEW OF WILDLIFE

Prior to the mid 1800's most wildlife populations in the Study Area were little influenced by European settlement. Wildlife numbers and ranges fluctuated naturally in response to periodic changes in climate, predation and habitat conditions. With the advent of the fur trade and subsequent land settlement, changes in wildlife population levels and distributions were accelerated, many of a permanent nature. These changes resulted directly from trapping and hunting, and extensive alterations to habitat.

Wildlife species which characterized the Souris Basin area prior to these more permanent disruptions were adapted to the open prairie grassland environment. Vast herds of bison and numerous smaller herds of pronghorn (**Antilocapra americana**) were the dominant ungulates (Hind 1859, Spry 1963, Nelson 1973). White-tailed jack rabbit (**Lepus townsendii**), coyote (**Canis latrans**), red fox (**Vulpes fulva**), badger (**Taxidea taxus**), Richardson's ground squirrel (**Spermophilus richardsoni**), grassland passerine birds and Sharp-tailed Grouse represented typical prairie species. Muskrats (**Ondatra zibethica**), Sandhill Cranes (**Grus canadensis**), Whooping Cranes (**Grus americana**) and a great variety of ducks and other marsh birds frequented the numerous prairie sloughs (Macoun 1882). Various raptors, including Ferruginous Hawk, Swainson's Hawk (**Buteo swainsoni**), Turkey Vulture (**Cathartes aura**) and Golden Eagle (**Aquila chrysaetos**) were common predators and scavengers.

Several species which frequented this region of Saskatchewan prior to or during early settlement have subsequently been extirpated, notably the bison (Hind 1859, Spry 1963, Stelfox 1979). A number of other species were likely former residents of the area, given their known earlier breeding ranges and habitat preferences.

The early 1900's were noteworthy for the general absence of big game, particularly in the open treeless plains. With the extirpation of the bison around 1880, hunting pressures shifted to other game species. Pronghorn were still present but in very diminished numbers as settlement and agricultural development pushed them back towards the less arable rangeland to the south and west. Deer (principally mule deer [**Odocoileus hemionus**]) were uncommon and largely restricted to the wooded river valleys and the Moose Mountain Upland. The first white-tailed deer to occur in the area probably moved in along the wooded drainages from adjacent Manitoba and North Dakota during this period (Bird 1961). In the Moose Mountain upland, elk (**Cervus canadensis**) were reported to be uncommon but still more numerous than deer.

Muskrat, mink (**Mustela vison**), weasel (**Mustela spp**), striped skunk (**Mephitis mephitis**), coyote, red squirrel (**Tamiasciurus hudsonicus**), and snowshoe hare (**Lepus americanus**) were abundant in river valleys at this time. White-tailed jack rabbits, red fox and badger were more abundant in grassland areas.

Sharp-tailed Grouse were very abundant and the Greater Prairie Chicken (**Tympanuchus cupido**) was common and wide spread in the early 1900's to 1920. The Greater Prairie Chicken did not occur in Saskatchewan prior to the 1900's, but moved in with early settlement (Stelfox 1979). Ducks were abundant during this period and sandhill cranes were still fairly common, nesting in the numerous prairie potholes. By this time, Whooping Cranes only appeared during migration.

During the 1920's and 30's several wildlife species increased in numbers while a few others virtually disappeared. With land settlement of the Black Soil zone and the curtailment of prairie fires, aspen "bluffs" sprang up on uncultivated lands and were soon occupied by white-tailed deer (Nixon 1973). The first Gray Partridge (**Perdix perdix**) and Ring-necked Pheasants (**Phasianus colchicus**) appeared in the 1920's in the Redvers-Wawota area of southeastern Saskatchewan. During the 1940's and 1950's white-tailed deer greatly increased their numbers and distribution, particularly following the spread and development of the aspen grove parkland. All upland game birds including Gray Partridge and Sharp-tailed Grouse as well as deer benefited from the large amount of farmland abandoned during the drought of the 1930's and left idle until the late 1940's and early 1950's. White-tailed deer populations probably peaked in southeastern Saskatchewan in the late 1950's and 1960's. Porcupines (Erethizon dorsatum) and red fox also flourished during the 1940's and 1950's but coyotes were depleted by an extensive poisoning and bounty program. Sharp-tailed Grouse remained abundant during the 1940's but declined in the latter 1950's with the reduction of native habitat. The wet years of the 1950's further reduced upland game bird reproduction but greatly enhanced waterfowl production.

4 CURRENT WILDLIFE HABITAT

At present, the majority of the Study Area is developed for agriculture, however nearly one quarter of the land still remains in native vegetation in areas where the topography or soil conditions have restricted cultivation, although even much of this area has been affected by cattle grazing. The glacial spillway flanking the Souris River is one of the largest blocks of uncultivated land in the Basin. This boulder-strewn channel, in some locations up to 6.5 km wide, continues to be used extensively by varied game species including Sharp-tailed Grouse, Ring-necked Pheasant, and white-tailed deer.

A Terrestrial Wildlife Habitat Inventory study was undertaken in southeastern Saskatchewan in the late 1970's (Stelfox 1979). It's purpose was to aid rational planning for preservation and management of wildlife habitat in the face of competing and conflicting land uses.

Wildlife habitat characteristics were described, with priority given to game species having predominantly terrestrial habitat requirements, notably white-tailed deer and Sharp-tailed Grouse as they are the most abundant and widely distributed game species. Mule deer and pronghorn were too uncommon and sporadic within the mapped area for identification of critical habitats by Stelfox (1979).

The best and most essential habitats in southeastern Saskatchewan for maintaining current populations of these and other wildlife species were identified as "critical" and mapped at a 1:250,000 scale (Stelfox 1979). Additional good habitat is available and utilized by these species and, although not mapped as critical, it plays an important supplementary role. Critical habitat also ranks at least "good" in a Provincial context. Any substantial alteration of these lands could result in permanent declines of regional populations.

Stelfox (1979) described the Study Area in terms of various land systems. These included the Washed Moraine land system, the Eroded land system occurring along the valley walls of the Souris River and Jewel and Roughbark Creeks, the Meltwater Channel land system and the Drainage land system. These four systems, taken together constitute the most important wildlife habitats in the Project Area.

In Washed Moraine upland areas, the uncultivated pastures are characterized by poor quality soils, stoney areas, or soils vulnerable to wind erosion; these areas do, however, provide seasonal or year-round habitat for many species of indigenous wildlife. There are few wetlands on the uplands within the Project Area.

The Eroded land system type of consequence to wildlife is found in the deeply incised valleys along the valley walls and treed, uncultivated areas. The micro-climatic diversity, shelter and variety of food plants have resulted in both introduced and indigenous species using the habitats on a seasonal or year-round basis as dictated by their adaptive requirements. White-tailed deer require these areas for winter shelter; they often move between irrigated lowland hay fields, uncultivated upland prairie and tree groves to obtain food and shelter, depending upon snow depth and weather severity. The Eroded land system habitats are particularly important as winter habitats for a variety of wildlife species which otherwise would not be found in the Study Area.

Of the four land systems described by Stelfox, the latter two will be the most affected by the Rafferty Project. Glacial Meltwater Channel land system such as the Souris River valley developed almost entirely from erosion within glacial drift. Bedrock has been exposed in portions of the valley west of Halbrite, near the Rafferty Dam site and further downstream near Roche Percee. Meltwater Channel land systems are very complex, with both erosional and depositional features present. The Souris channel walls are steeply sloping, with occasional eroded coulees extending considerable distances back from the valley. Surface drainage varies from excessive along the steep valley walls to very poor on the valley floor. Small shallow wetlands frequently occur on the bottom of the flat valley floor but they require periodic re-flooding by spring meltwaters or summer thunderstorms to retain the characteristics of wetland habitats. Annual crops (oats, barley and wheat) are grown on some of the better drained portions of the alluvial floodplains.

The natural vegetation of this land system is very diverse, ranging from grassland and low shrub communities on valley slopes to moist meadows, marshes and wetlands, tall shrub lands and treed lands. In the Rafferty Project Area, the well-treed areas occur only around the confluence of the Souris River with Roughbark and Jewel Creeks.

It is this diversity of landform and vegetation which provides the excellent wildlife habitat for a wide range of species. Important habitats vary from river channel and floodplain marshes (for ducks, beaver (Castor canadensis), muskrat, turtles, snakes) to wooded valley bottoms and slopes (deer, owls, passerine birds), to more open shrubby draws (Ring-necked Pheasant) and grassy hillsides (Sharp-tailed Grouse, raptors). Native grass and shrub vegetation also provides valuable cover for Gray Partridge utilizing adjacent cultivated uplands. The modest amount of crop cultivation within the meltwater channel may actually enhance habitat characteristics for white-tailed deer, Sharp-tailed Grouse and Ring-necked Pheasant by providing additional food sources (Stelfox 1979).

The Drainage land system, described by Stelfox (1979), includes typical prairie streams which derive most of their annual flow from snowmelt and early spring rains. Seventy-five percent of the annual flow occurs in April, May and June, with minimal or no flows the rest of the year. Dry stream beds are most common in the summer and fall. Most of these lands remain in native vegetation, as along and within Roughbark and Jewel Creeks in the Rafferty Project Area.

This land system provides high quality habitat for white-tailed deer, Ring-necked Pheasant, Sharp-tailed Grouse, beaver and to some extent turtles. Habitat capability is often restricted by heavy grazing pressures or encroachment of cultivation.

Overall, agricultural activities have dramatically reduced wildlife habitat in the Study Area, however, these same activities may have increased the variety and availability of wildlife foods, including farm crops, and habitat diversity.

A review of the habitat requirements of the resident species in the region reveals that in all cases, the remaining native grasslands provide the most important habitat for the wildlife of the region. Although most species are not limited to these areas, these are the areas which provide cover, food and protection during at least part of the year. It is the availability of 'native' habitat which is important to the survival of most of the species in the Study Area.

PHOTO ONE: Souris River at north end of Midale SDA Community Pasture. Wooded edges along river provide habitat for beaver, muskrat, painted turtles, birds and white-tailed deer. Area in left centre has been designated "Critical Habitat" by Saskatchewan Parks, Recreation and Culture.

(Photo courtesy SBDA)

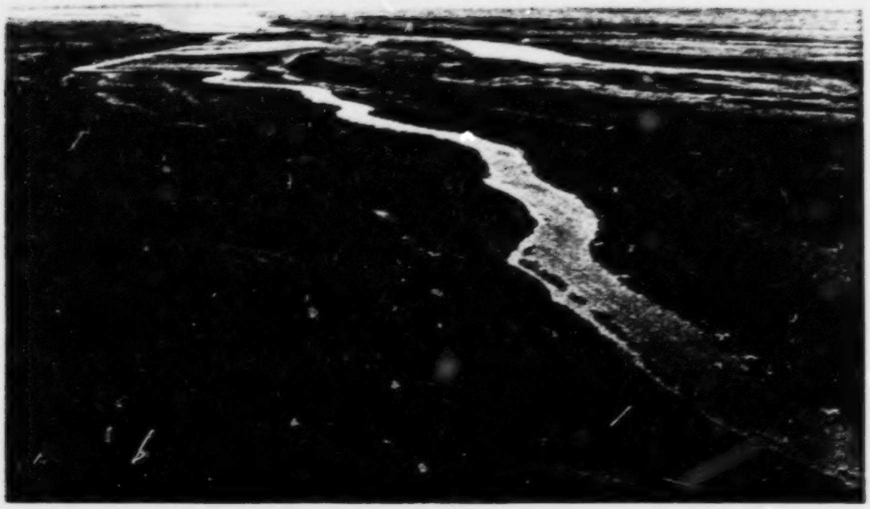


PHOTO TWO: Glacial Meltwater Channel land system upstream of Rafferty Dam Site looking southeast. Elevated land between main Souris River channel and McDonald Lake (upper right) will become an island.
(Photo courtesy Saskatchewan Power Corporation)

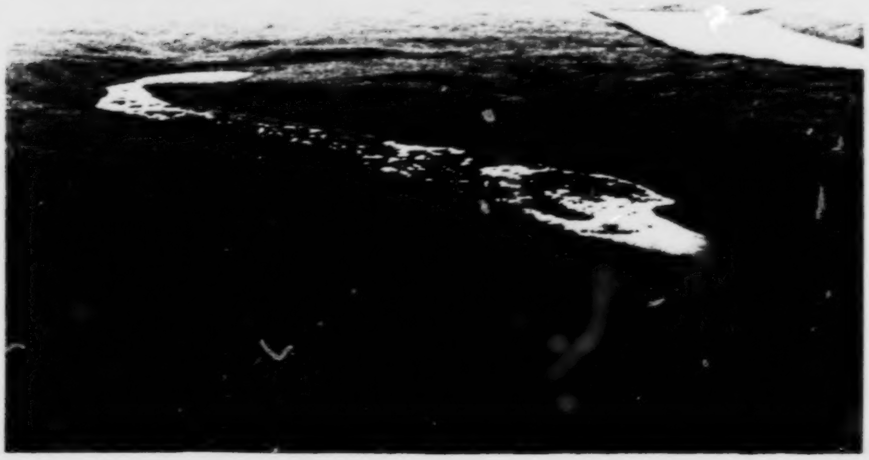


PHOTO THREE: West end of second island to be created southeast of McDonald Lake (upper right), looking northwest. Note absence of trees and concentration of boulders along the eroded channels. Entire area shown is important habitat for Sharp-tailed Grouse.
(Photo courtesy Saskatchewan Power Corporation)

PHOTO FOUR: Washed Moraine bordering the Souris River (background) and Roughbark Creek (foreground) in Lomond #1 PFRA Community Pasture. This land system remains almost entirely in native vegetation and is critical habitat for Sharp-tailed Grouse throughout.
(Photo courtesy Saskatchewan Parks, Recreation and Culture)

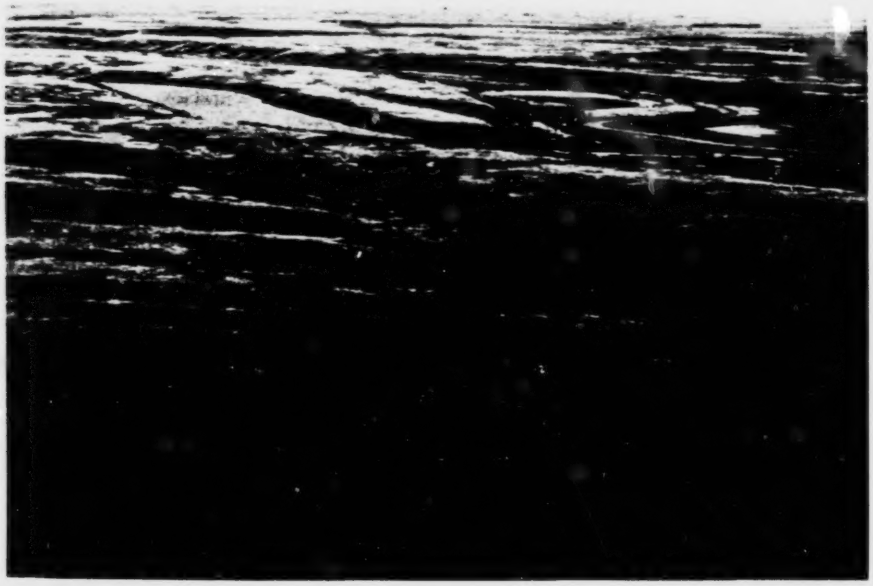


PHOTO FIVE: High relief washed moraine in McDonald Lake area northwest of Estevan. Trees are virtually absent but shrub cover is present in more rugged areas. The area is critical habitat for white-tailed deer and Sharp-tailed Grouse.
(Photo courtesy Saskatchewan Parks, Recreation and Culture)

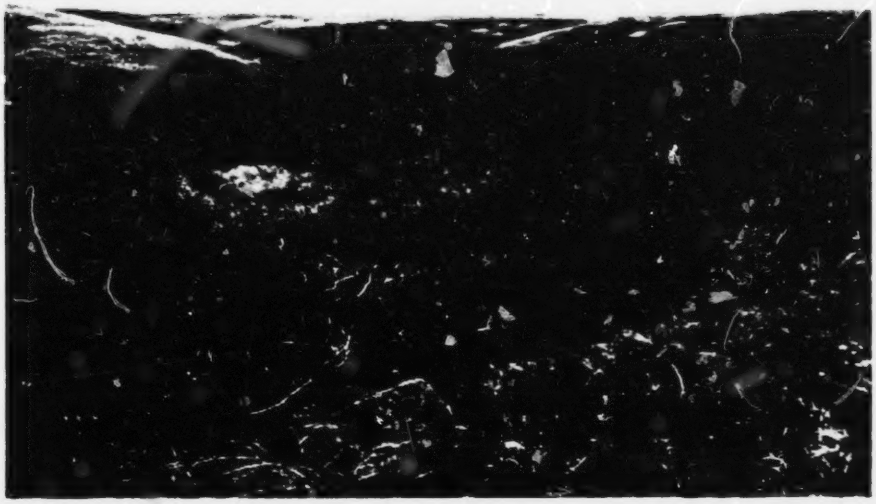


PHOTO SIX: High relief moraine south of Long Creek provides excellent habitat for Ring-necked Pheasant and Sharp-tailed Grouse.

(Photo courtesy Saskatchewan Parks, Recreation and Culture)

PHOTO SEVEN: Drainage land system showing Long Creek south of Torquay. Native vegetation is restricted to the active floodplain. Excellent habitat for Ring-necked Pheasant, white-tailed deer and beaver and very good nesting and roosting habitat for Sharp-tailed Grouse.

(Photo courtesy Saskatchewan Parks, Recreation and Culture)

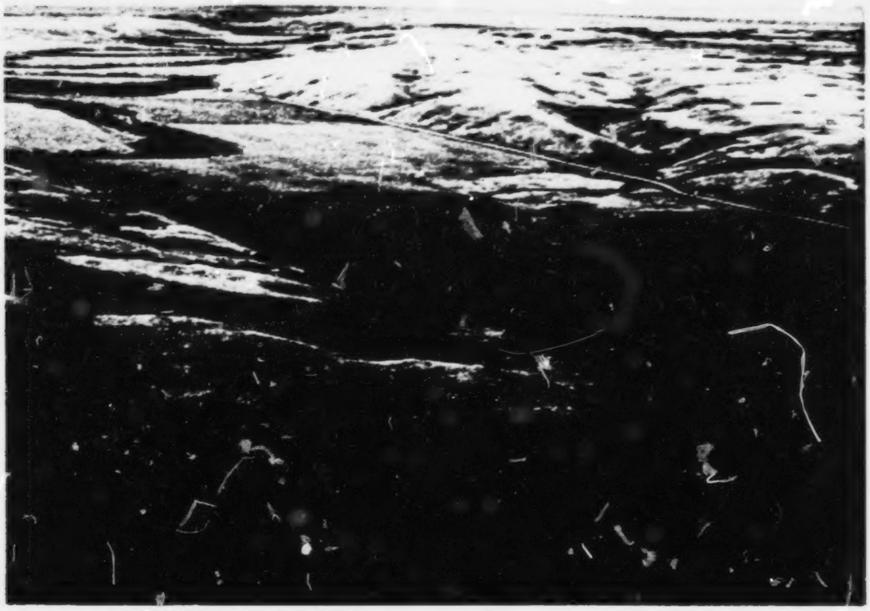


PHOTO EIGHT: Meltwater channel - drainage land system complex along Souris River Valley. Alluvium of valley floor supports cultivation of tame hay and annual crops. Complex provides excellent habitat for white-tailed deer, Ring-necked Pheasant and beaver. River also provides critical habitat for western painted and common snapping turtles. Native grass and shrubs on valley walls provide excellent habitat for Sharp-tailed Grouse and Ferruginous Hawks.

(Photo courtesy Saskatchewan Parks, Recreation and Culture)

PHOTO NINE: Spoil piles from very old (40 to 50 years) coal strip mining activities southeast of Estevan. This area provides limited habitat for fox, beaver, muskrat, ducks, Ring-necked Pheasants and white-tailed deer. These areas will be re-mined in future to remove deeper coal seams.

(Photo courtesy Saskatchewan Parks, Recreation and Culture)

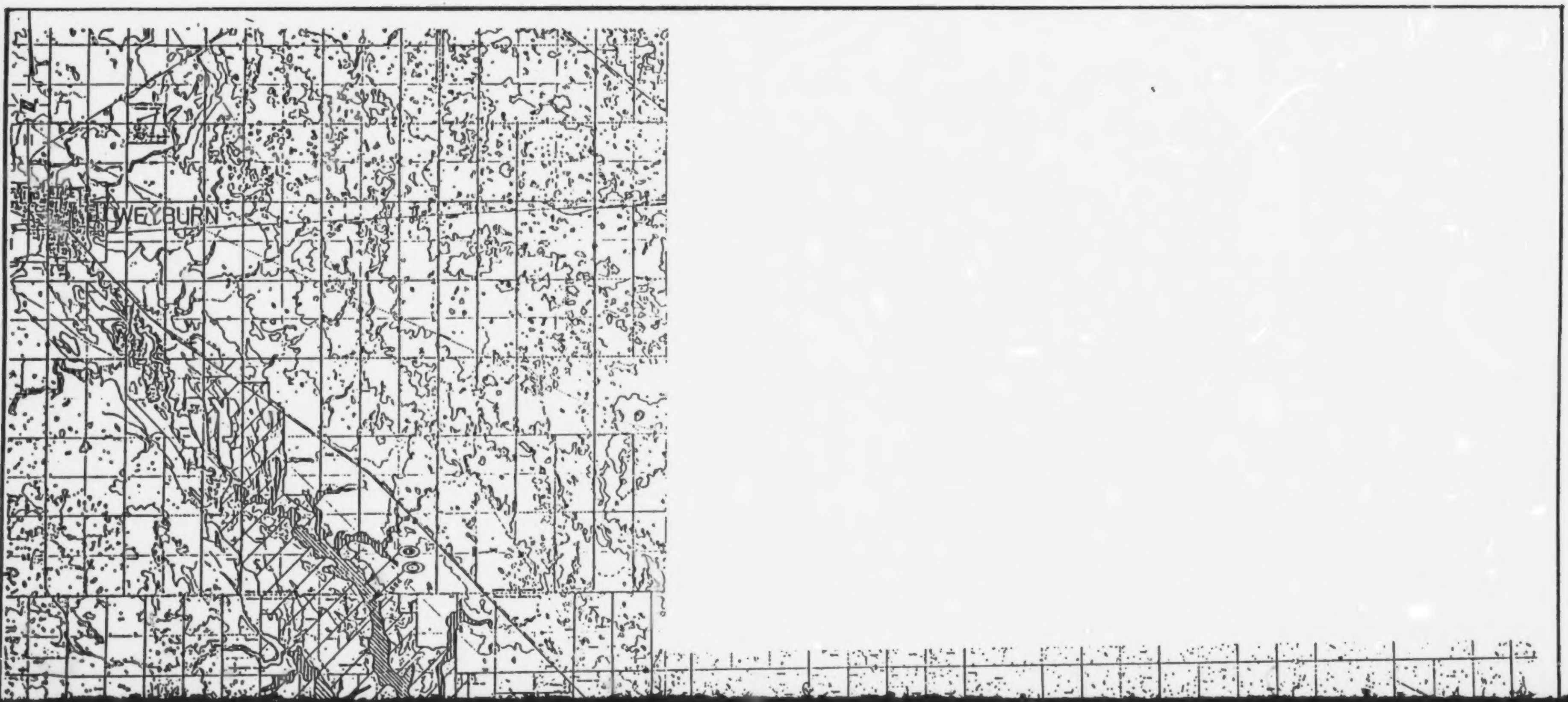
The most important habitat for wildlife is illustrated in Figures 1 and 2. It is the alteration or loss of these areas which is likely to have the greatest effect on resident wildlife populations if appropriate mitigative steps are not taken.

The significance of these lands within the province is emphasized by Stelfox (1979). "White-tailed deer and Sharp-tailed Grouse are the most abundant and widely distributed game species, with both favoring mature vegetation for shelter but making good use of agricultural products as additional sources of food. Some of the highest population densities within the province are found within the map area (Weyburn-Virden)..." The most important area for white-tailed deer in southern Saskatchewan is outside the Rafferty Project Area. However, historical data shows that the Souris River valley has become one of the most important winter habitats for this species in the Weyburn-Estevan area. The grasslands of the Study Area have been identified as supporting some of the highest numbers of Sharp-tailed Grouse in the Province.

The importance of the Souris River valley is recognized by the legislated designation of portions of the valley as 'Critical Wildlife Habitat' under the Critical Wildlife Habitat Protection Act. Permanent protection has been given to some areas of Crown land within the province that are considered important in sustaining regional wildlife populations. Noble and Flory (1978) attribute the importance of the habitat in this area to the diversity of vegetation which provides food and cover during winter.

As with the Souris River Valley downstream from the Midale Dam, the section of the Moose Mountain Creek corridor which would be affected by the proposed Alameda development encompasses habitats which have only very slight limitations to the production of waterfowl (Canada Land Inventory Class 2). The excellent nearby upland habitat consisting of grasses and shrubs such as snowberry-rose-chokecherry in association with aspen groves, provides high quality nesting cover. The intermittent supply of water to the system combined with drought may, however, periodically result in limited availability of water for brood rearing. Nonetheless, over the past 15 years, losses of other nesting habitat in the region due to changing agricultural land practices has elevated the importance of remaining suitable habitats.

A 1985 draft report relating to the North American Waterfowl Managment Plan jointly prepared by Environment Canada and the U.S. Department of the Interior,


WEYBURN

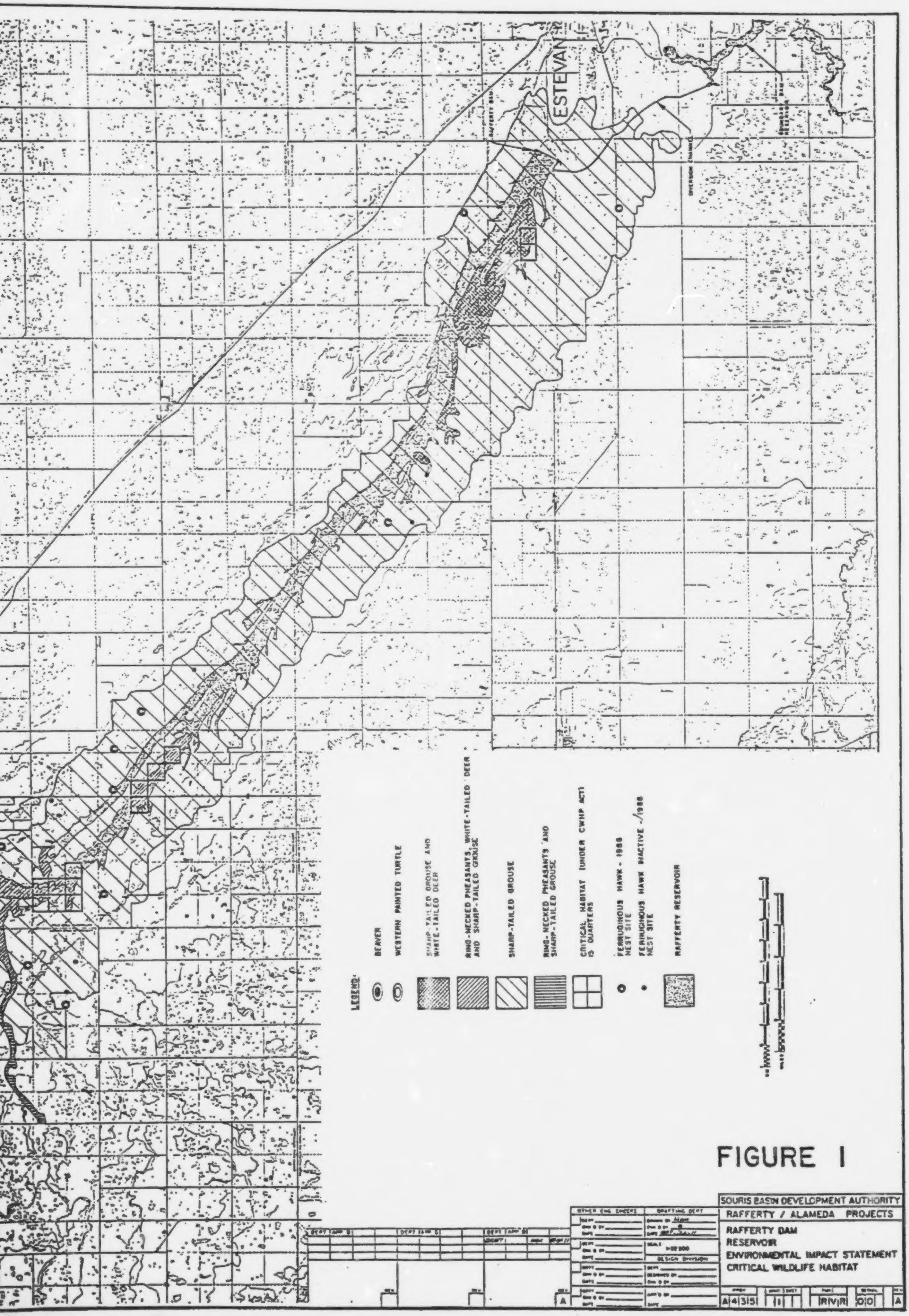

ESTEVAN
DIVERSION CHANNEL
RAFFERTY DAM
BOUNDARY RESERVOIR
LEGEND:
BEAVER
WESTERN PAINTED TURTLE
SHARP-TAILED GROUSE AND WHITE-TAILED DEER
RING-NECKED PHEASANTS, WHITE-TAILED DEER AND SHARP-TAILED GROUSE
SHARP-TAILED GROUSE
RING-NECKED PHEASANTS AND SHARP-TAILED GROUSE
CRITICAL HABITAT (UNDER CWHP ACT) IS QUARTERS
FERRUGINOUS HAWK - 1988 NEST SITE
FERRUGINOUS HAWK INACTIVE -/1988 NEST SITE
RAFFERTY RESERVOIR

FIGURE I

SOURIS BASIN DEVELOPMENT AUTHORITY
RAFFERTY / ALAMEDA PROJECTS

RAFFERTY DAM
RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
CRITICAL WILDLIFE HABITAT

A 4 3 5 | 1 | R V R | 0 0 | A

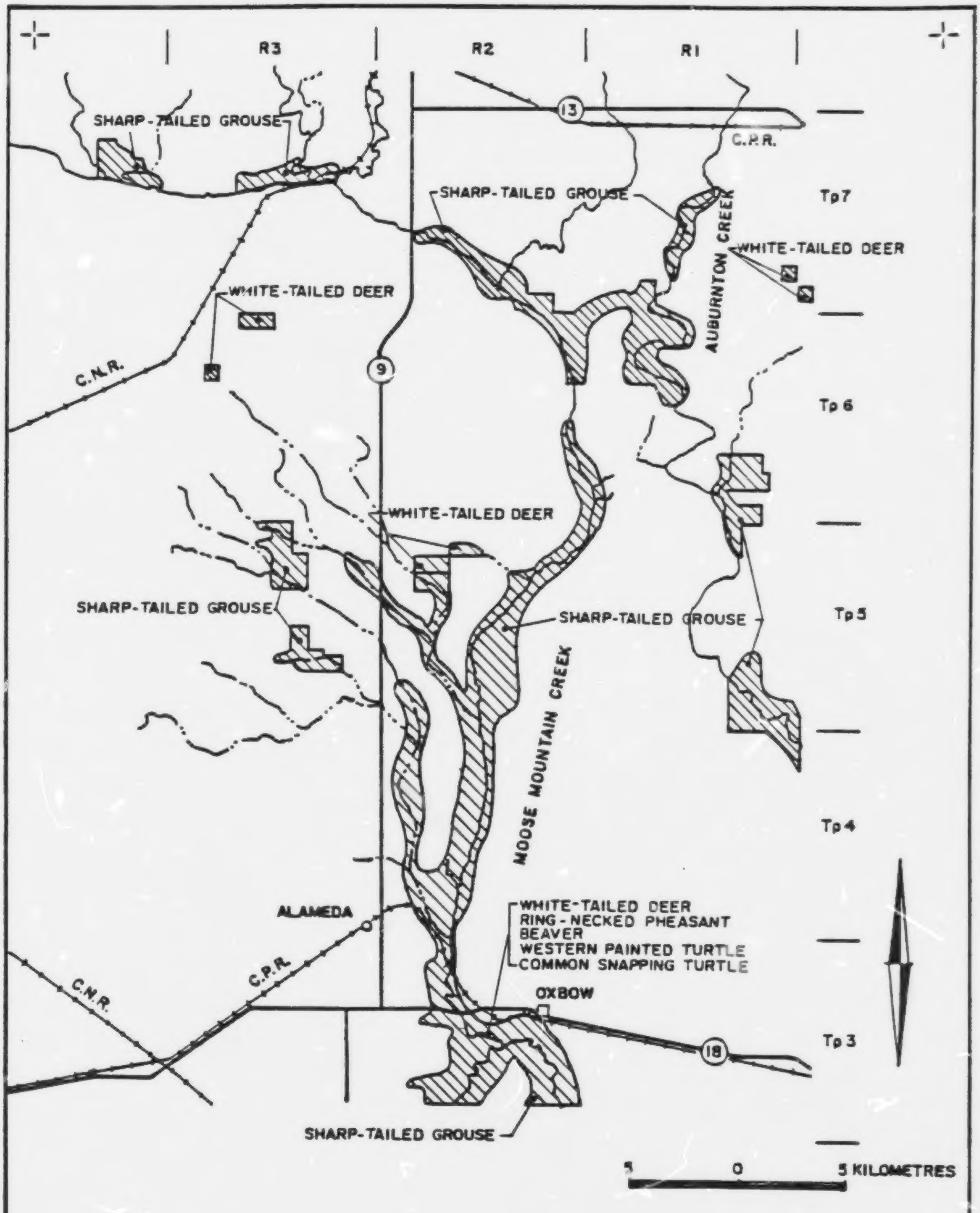

R3
R2
R1
13
C.P.R.
SHARP-TAILED GROUSE
SHARP-TAILED GROUSE
Tp 7
AUBURNTON CREEK
WHITE-TAILED DEER
WHITE-TAILED DEER
C.N.R.
9
Tp 6
WHITE-TAILED DEER
SHARP-TAILED GROUSE
SHARP-TAILED GROUSE
Tp 5
MOOSE MOUNTAIN CREEK
Tp 4
ALAMEDA
WHITE-TAILED DEER
RING-NECKED PHEASANT
BEAVER
WESTERN PAINTED TURTLE
COMMON SNAPPING TURTLE
C.N.R.
C.P.R.
OXBOW
18
Tp 3
SHARP-TAILED GROUSE
5
0
5 KILOMETRES

FIGURE 2

CRITICAL
WILDLIFE HABITAT AREA
ALAMEDA RESERVOIR

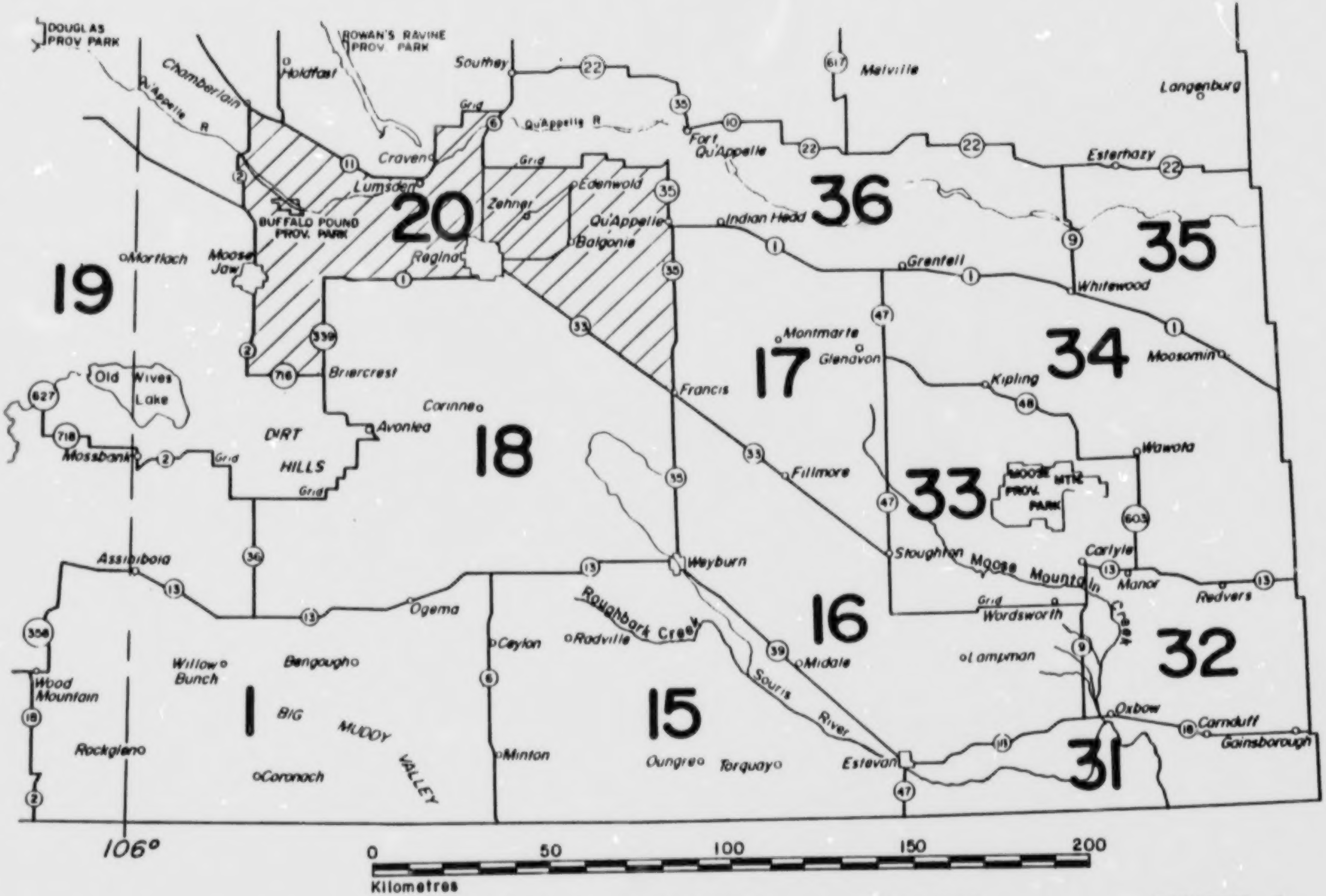
signaled losses in nesting cover (which has concentrated ducks and their predators in the remaining patches of suitable habitat) to be responsible for significant declines in dabbling duck populations. Moose Mountain Lake, located upstream of the proposed Alameda Reservoir constitutes important waterfowl production habitat in the region. The status of current species diversity in Moose Mountain Creek in general is expected to be similar to the Souris River system; the diversity and production of this area will be documented by 1987 field investigations of the proposed Alameda Reservoir. Moose Mountain Creek is not considered important to the production of geese. The paucity of large permanent waterbodies in the vicinity of Moose Mountain Creek restricts the value of the area for migrating geese.

Blood and Associates (1978) identified the lower Moose Mountain Creek as important for waterfowl production and Stelfox (1979) rated most of this portion of the creek as "critical" Sharp-tailed Grouse habitat. Neither study considered the area to be particularly important for white-tailed deer owing to the limited development of hardwood stands along this portion of the valley wall which they believed were essential for winter cover. Saskatchewan Parks, Recreation and Culture wildlife personnel, however, estimate the Alameda Reservoir Area to be important winter habitat for up to 300 white-tailed deer. Population survey information collected since 1980 in other portions of Wildlife Management Zone (WMZ) 32 have resulted in "high" class habitat ratings for most valley complexes. Severe winter conditions occur infrequently in this area offering deer definite energetic advantages which are expressed through higher rates of productivity than is observed in most of the Saskatchewan deer range (Stewart 1986, in Press). In addition, Moose Mountain Creek likely serves as a major travel corridor providing deer access to other habitats throughout the eastern portion of Wildlife Management Zone (WMZ) 32 and may be very important to the regional ecology of this species (Figure 3).

RARE, THREATENED AND ENDANGERED SPECIES

1 INTRODUCTION

A variety of authors have assembled lists of species which include terms such as "endangered" or "rare" to describe species "at risk". The classifications can


DOUGLAS PROV PARK
ROWAN'S RAVINE PROV. PARK
BUFFALO POUND PROV. PARK
MOOSE MTN PROV. PARK
Chamberlain
Qu'Appelle R
Holdfast
Southey
Craven
Lumsden
Moose Jaw
Mortlach
Regina
Zehner
Edenwold
Qu'Appelle
Balgonie
Fort Qu'Appelle
Indian Head
Melville
Langenburg
Esterhazy
Grenfell
Whitewood
Moosomin
Montmarte
Glenavon
Kipling
Wawota
Francis
Fillmore
Stoughton
Moose Mountain Creek
Carlyle
Manor
Redvers
Wordsworth
Lampman
Carnduff
Gainsborough
Oxbow
Estevan
Midale
Souris River
Weyburn
Roughbark Creek
Radville
Ceylon
Minton
Oungre
Torquay
Ogema
Bengough
Willow Bunch
Coronach
BIG MUDDY VALLEY
Wood Mountain
Rockglen
Assiniboia
Old Wives Lake
Mossbank
DIRT HILLS
Avonlea
Corinne
Briercrest
Grid
1
2
6
9
10
11
13
18
22
33
35
36
39
47
48
339
358
603
617
627
716
718
19
20
36
35
34
17
18
33
16
32
15
1
31
106°
0
50
100
150
200
Kilometres

GAME MANAGEMENT ZONES (1985)
SASKATCHEWAN PARKS, RECREATION & CULTURE

FIGURE 3

be confusing because first, classifications exist for individual provinces, Canada as a whole and internationally; second, definitions such as "rare" or "endangered" are not consistent among the various classifications. The 1986 list published by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) of the Canadian Wildlife Federation is however, now considered by wildlife agencies across Canada to be Canada's official classification scheme. The definitions used by COSEWIC are as follows:

- Rare
  Any Canadian species that because of its biological characteristics or because it occurs at the fringe of its range or for some other reason, exists in low numbers or in very restricted areas in Canada, but is not a threatened species.
- Threatened
  Any indigenous species that is likely to become endangered in Canada if the factors affecting its vulnerability do not become reversed.
- Endangered
  Any indigenous species whose existence in Canada is threatened with immediate extinction throughout all or a significant portion of its range owing to the action of man.

Only those species which are known or expected to breed in or migrate through Saskatchewan, are discussed herein.

i) Rare Species

The four species listed by COSEWIC (1986) as being "rare" in Saskatchewan include Trumpeter Swan (**Olor buccinator**), Caspian Tern (**Sterna caspia**), Great Gray Owl (**Strix nebulosa**) and black-tailed prairie dog (**Cynomys ludovicianus**). Only the Great Gray Owl has been recorded in the Study Area (Souris Basin Development Authority, Background Report).

ii) Threatened Species

The five species listed as being "threatened" include American White Pelican (**Pelecanus erythrorhynchos**), Ferruginous Hawk, Peregrine Falcon (**Falco peregrinus tundrius**), Piping Plover (**Charadrius melodus**) and Burrowing Owl. Of these species, the Ferruginous Hawk, Burrowing Owl and American White Pelican are known to nest in southern Saskatchewan but no evidence of this activity was encountered in the Study Area for the latter species. The Peregrine Falcon does not nest in the province but is considered a seasonal migrant through southeastern Saskatchewan (Richards and Fung 1969).

With specific reference to the Study Area, the extensive areas of uncultivated prairie provide preferred habitat for Burrowing Owls and the shrubs and scattered poplars along the Souris River and on the adjacent upland provide suitable nest sites for Ferruginous Hawks. A number of known nesting sites in the Study Area are shown in Figure 1. There are no candidate nesting areas for American White Pelicans within the Study Area.

iii) Endangered Species

Five species are listed as endangered, including the wood bison (**Bison bison athabascae**), Peregrine Falcon (**Falco peregrinus anatum**), Greater Prairie-Chicken (**Tympanuchus cupido**) and Whooping Crane. Of these, the wood bison should more rightly be classed as extirpated since there are no records of either from the Province during the last two decades. In contrast, the Greater Prairie-Chicken, formerly thought to be extirpated in Saskatchewan, is now known to frequent at least southwestern Saskatchewan as a least three individual birds were observed near Val Marie in May, 1987. Both the swift fox (**Vulpes velox**) and black-Footed ferret (**Mustela nigripes**) are presently listed as extirpated. The Whooping Crane and Peregrine Falcon are considered seasonal migrants through Saskatchewan but are not known to nest in the Province. The breeding range of the Piping Plover encompasses all of southern Saskatchewan but the lack of suitable habitat in the Rafferty Project Area suggests this species would not be negatively impacted. None of the foregoing species would be affected by the proposed developments of the Rafferty Reservoir and the Alameda Reservoir.

CURRENT WILDLIFE

1 INTRODUCTION

The Wildlife Management Zones (WMZ) which encompass the Study Area are considered to include some of the best hunting areas in Saskatchewan for white-tailed deer, Sharp-tailed Grouse, Ring-necked Pheasant and Gray Partridge. Goose and duck hunting are not major recreational activities in the project region because there are few waterbodies which are attractive to waterfowl during the fall migration period. Given the economic importance of these game species, Provincial and Federal agencies have devoted considerable effort toward gathering information on the status of these species in order to facilitate effective management. Not surprisingly then, the information base is much stronger for game as opposed to non-game species, although a broad diversity of non-game species occurs in the Study Area (e.g., Weidl 1985, 1986, Stelfox 1979). Consequently, proportionately larger amounts of subsequent discussions pertaining to wildlife are devoted to game as opposed to non-game species.

2 AMPHIBIANS AND REPTILES

Knowledge of the distribution and population size of most Saskatchewan reptiles is limited (Secoy and Vincent 1976). Many of the species are at the northern extremity of their respective ranges and although not endangered with regard to overall numbers according to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 1986), they may be rare within Saskatchewan.

Richards and Fung (1969) reported nine species within the Study Area, while Secoy and Vincent (1976) indicated that 12 species occur within the Study Area, although nearly all are at or near their range limits. Table 1 summarizes the present state of knowledge concerning amphibians and reptiles within the Study Area.

The Souris River system is one of the very few drainage systems in the province which is known to support populations of western painted turtles **(Chrsemys picta belli)** and common snapping turtles **(Chelydra serpentina)** (Stelfox 1979, Weidl 1985, 1986). Critical habitat was identified by Stelfox for both species along the Souris River from the U.S. border upstream to Estevan. This section of the river is generally slow flowing with deep channels, numerous meander cutoffs and wooded banks, all of which provide preferred habitat for these turtles. Critical habitat has also been mapped for the more widely distributed western painted turtle along wooded portions of Roughbark Creek and portions of the Souris River upstream from its confluence with Roughbark Creek.

No systematic surveys were conducted for either reptiles or amphibians but the spring and summer waterfowl production surveys and the spring fish surveys were timed to coincide with seasonal activities which would have made reptiles or amphibians conspicuous.

TABLE 1

Status of Amphibians and Reptiles in Southeastern Saskatchewan

Species	Distribution	Abundance	Habitat
Tiger Salamander **Ambystoma tigrinum**	Widely distributed	Common	Permanent water bodies
Plains Spadefoot Toad **Scaphiopus bombifrons**	Widely distributed	Never numerous	Dry grassland prairies
Great Plains Toad **Bufo cognatus**	Unknown	Never numerous	Dry grassland prairies
Canadian Toad **Bufo hemiophrys**	Widely distributed	Locally common	Grassland, parkland
Leopard Frog **Rana pipiens**	Widely distributed	Abundant	Most permanent water bodies
Wood Frog **Rana sylvatica**	Widely distributed	Locally abundant	Wooded areas
Common Snapping Turtle **Chelydra serpentina**	Limited to Souris and Qu'Appelle watersheds	Uncommon	Permanent, wooded rivers systems
Western Painted Turtle **Chrysemys picta belli**	Widely distributed	Probably locally common	Permanent rivers
Western Plains Garter Snake **Thamnophis radix haydeni**	Widely distributed	Abundant	Grasslands and aspen parklands
Red-sided Garter Snake **Thamnophis sirtalis parietalis**	Abundant near Estevan	Unknown	Diverse
Plains Hog-nosed Snake **Hetrodon nasicus nasicus**	Northern limit of distribution	Unknown	Short grass prairie
Smooth Green Snake **Opheodrys vernalis**	Western limit of range	Rare	Prairie and open parkland, moist river or coulee bottoms

Sources: Secoy and Vincent (1976), Weidl (1985), (1986).

PHOTO TEN: Western painted turtle in Souris River Valley.
(Photo courtesy Environmental Management Associates)

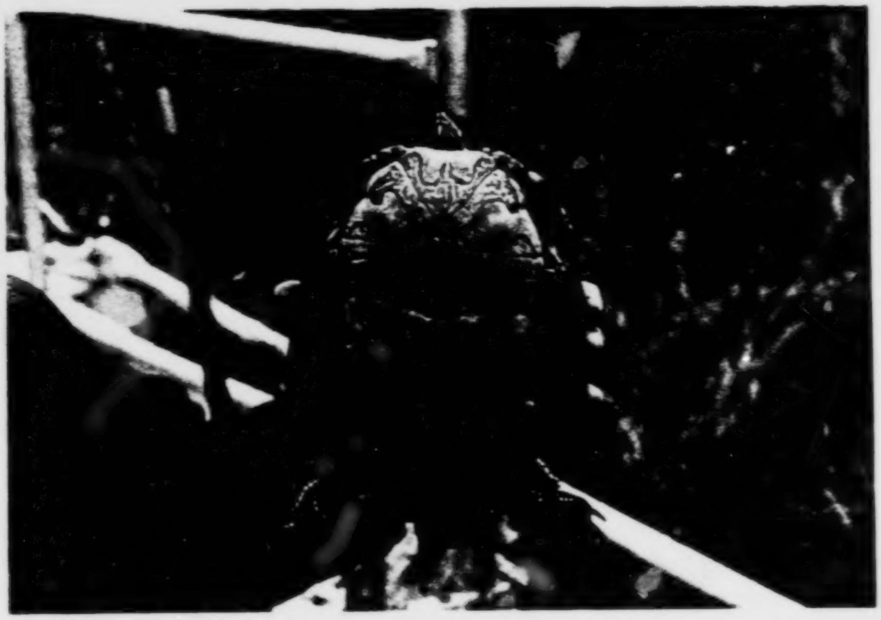


PHOTO ELEVEN: Western painted turtle (underside).
(Photo courtesy Environmental Management Associates)

Amphibians were not seen during these surveys however two reptiles, the western painted turtle and the common snapping turtle were recorded (Souris Basin Development Authority Background Study 1986, D. Fernet and S. Matkowski 1987, Environmental Management Associates pers. comms.). Individuals and groups of up to five western painted turtles were common along the Souris River upstream of Dr. Mainprize Regional Park in the 1984 survey. None were seen downstream of Midale Dam. However, at least 50 western painted turtles were counted in an area of about 100 m^2 in the small bay near the Dead Lake water level control gates, on 16 July 1984. This was the greatest concentration of turtles observed. Weidl (1985, 1986) reported that western painted turtles were commonly encountered along the Souris River downstream of Estevan. Weidl (op cits.) reported both snapping turtles and western painted turtles on the Souris River near its confluence with Moose Mountain Creek. Their occurrence on this creek may vary from year to year as Moose Mountain Creek occasionally contains little or no water in mid-summer (Water Survey of Canada, unpubl. data). During an April, 1987 fisheries investigation, D. Fernet and S. Matkowski (Environmental Management Associates pers. comms.) reported that three common snapping turtles were encountered on Long Creek, above its confluence with the Souris River, and western painted turtles were observed on Moose Mountain Creek.

The April, 1987 survey was conducted concurrently with a fisheries electrofishing survey on various reaches of the Souris River, Roughbark Creek, Long Creek and Moose Mountain Creek. Along 62.5 km of river and creek negotiated by two biologists in a boat, 273 painted turtles and four common snapping turtles were observed (Table 2). There was considerable variation in the density of western painted turtles per kilometre of river or creek, with the majority of turtles observed in the 8 km reach of the Souris River upstream, from Oxbow past the confluence with Moose Mountain Creek. 109 western painted turtles and one snapping turtle were observed here. The highest density of turtles occurred in the 1.5 km reach of Long Creek upstream from its confluence with the Souris River.

Neither of these reaches containing high densities of turtles are within areas proposed for impoundment. The densities of turtles in those reaches to be impounded are considerably less, ranging from 0.33 turtles/km on Moose Mountain Creek upstream from the proposed Alameda Dam site, to 3.0 turtles on Roughbark Creek upstream from its confluence with the Souris River. The average density of

TABLE 2

Souris River System Turtle Survey

Reach Location	Length of Survey	Number of Painted Turtles (or other)	Average Number of Painted Turtles Per Km
Souris River downstream from Oxbow	6.5 km	20 painted turtles	3.08
Souris River from Oxbow upstream past confluence with Moose Mountain Creek	8.0 km	109 painted turtles (1 snapping turtle)	13.63
Souris River, Roche Percee Campground (1.5 km upstream, 1 km downstream)	2.5 km	12 painted turtles	4.8
Souris River, Woodlawn Campground to confluence with Long Creek	4.0 km	15 painted turtles	3.75
Long Creek mouth upstream	1.5 km	50 painted turtles (3 snapping turtles)	33.33
Moose Mountain Creek upstream from dam site	3.0 km	1 painted turtle	0.33
Moose Mountain Creek Alameda Dam Site downstream	9.5 km	5 painted turtles	0.53
Souris River, Midale/Dead Lake Dam downstream	2.0 km	2 painted turtles	1.0
Souris River, Midale Dam upstream to Mainprize Park	6.5 km	3 painted turtles	0.46
Souris River, Mainprize Park to Ironbridge near Roughbark Creek confluence	12.0 km	42 painted turtles	3.5
Souris River, Iron Bridge upstream	3.0 km	7 painted turtles	2.33
Roughbark Creek upstream from Souris Creek confluence	1.0 km	3 painted turtles	3.0
Souris River bridge west of Halbrite, downstream	3.0 km	4 painted turtles	1.33
TOTAL: Random Survey	62.5 km	273 painted turtles 4 snapping turtles	4.37

Source: D. Fernet and S. Matkowski pers. comm., April 1987.

turtles in all surveyed portions of the Souris River, Roughbark Creek and Moose Mountain Creek was 2.11 per km (58 turtles in 27.5 km).

3 BIRDS

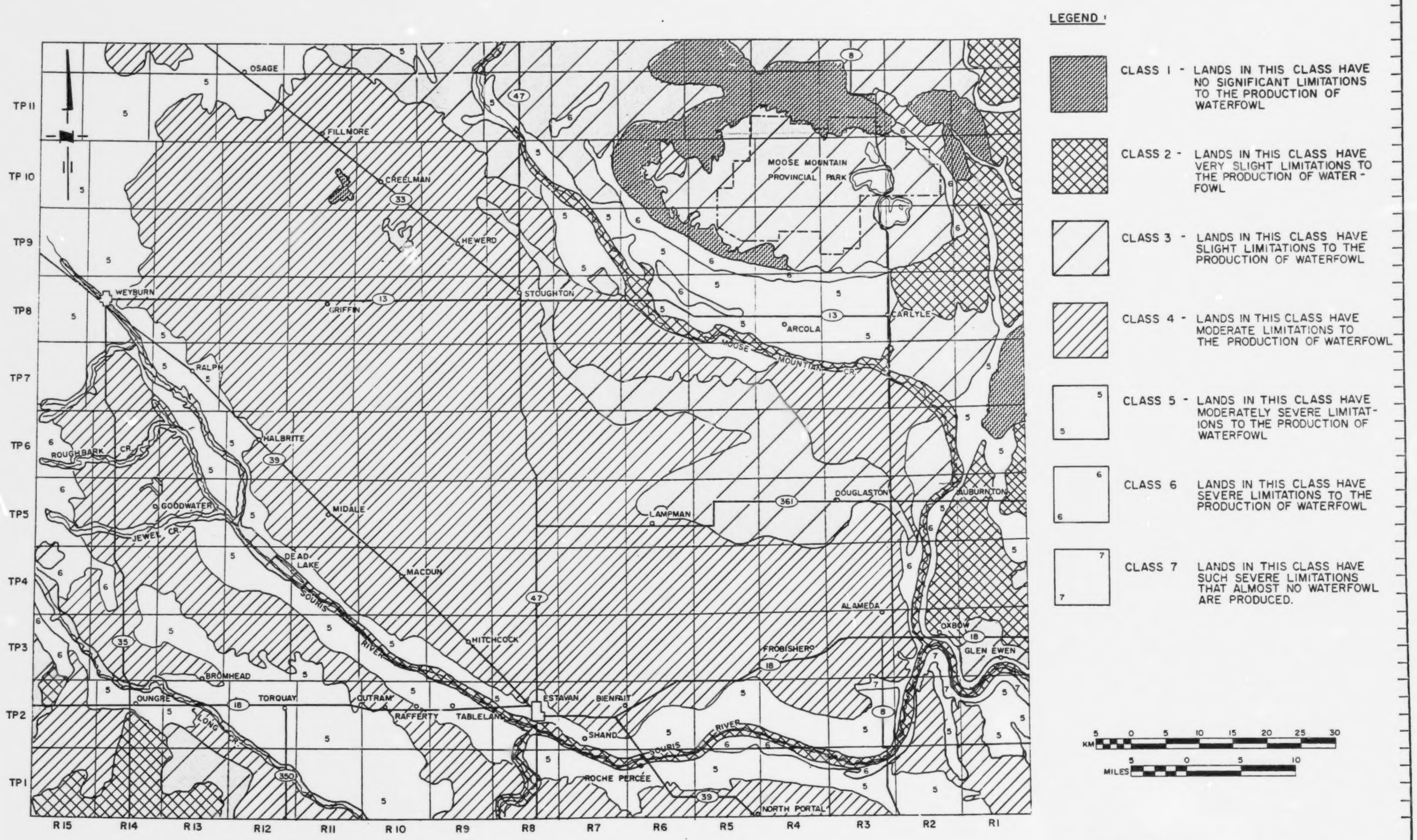
i) Waterfowl

According to the Canada Land Inventory (1968), the best waterfowl habitat (Classes 1 to 3) in the Study Area occur in the rolling morainic plains of the Missouri Coteau in the southwest and the uplands surrounding Moose Mountain Provincial Park, and to the south and east. Both areas are well supplied with permanent and semi-permanent sloughs. Many of the water bodies within the Moose Mountain Upland are poorly vegetated and are subject to drawdown. The largest water bodies and wetlands, including Kenosee and White Bear Lakes, have little waterfowl production value but wildfowl use them during migration. Moose Mountain Lake and Gooseberry Lake are also used as staging areas during migration.

Most of the Souris Plain, limited primarily by flat topography and the absence of permanent sloughs, has been rated as having moderate limitations for waterfowl production (Class 4). The low water holding capacity on outwash deposits, especially on uplands adjacent to the Souris River and Moose Mountain Creek, reduce those areas to Class 5. Capability for waterfowl production on these lands is moderately low due to a combination of limitations including climate, soil moisture, fertility, permeability, topography and a poor interspersion of water areas.

The Souris River and Moose Mountain Creek throughout the Study Area are rated as good production areas (Class 2 and 3). The only significant limiting factors include poor distribution or interspersion of marshes or basins and reduced marsh edges due to topographic features.

As indicated by the Canada Land Inventory (Figure 4), waterfowl production within the Study Area is largely concentrated in and along the Souris River and Moose Mountain Creek. All of Moose Mountain Creek below Moose Mountain Lake, and the Souris River downstream from the Midale Dam are rated as Class 2, having very slight limitations to the production of waterfowl. There were very few sloughs on the adjacent uplands which maintained water levels required for brood production in 1984, 1985 or 1986. Those in the pasture lands which parallel the Souris tend to lack suitable vegetation cover as a result of cattle grazing.



LEGEND :
CLASS 1 - LANDS IN THIS CLASS HAVE NO SIGNIFICANT LIMITATIONS TO THE PRODUCTION OF WATERFOWL
CLASS 2 - LANDS IN THIS CLASS HAVE VERY SLIGHT LIMITATIONS TO THE PRODUCTION OF WATERFOWL
CLASS 3 - LANDS IN THIS CLASS HAVE SLIGHT LIMITATIONS TO THE PRODUCTION OF WATERFOWL
CLASS 4 - LANDS IN THIS CLASS HAVE MODERATE LIMITATIONS TO THE PRODUCTION OF WATERFOWL
CLASS 5 - LANDS IN THIS CLASS HAVE MODERATELY SEVERE LIMITATIONS TO THE PRODUCTION OF WATERFOWL
CLASS 6 LANDS IN THIS CLASS HAVE SEVERE LIMITATIONS TO THE PRODUCTION OF WATERFOWL
CLASS 7 LANDS IN THIS CLASS HAVE SUCH SEVERE LIMITATIONS THAT ALMOST NO WATERFOWL ARE PRODUCED.
KM 5 0 5 10 15 20 25 30
MILES 5 0 5 10
TP11
TP10
TP9
TP8
TP7
TP6
TP5
TP4
TP3
TP2
TP1
R15
R14
R13
R12
R11
R10
R9
R8
R7
R6
R5
R4
R3
R2
R1
OSAGE
FILLMORE
CREELMAN
33
HEWERD
47
8
MOOSE MOUNTAIN PROVINCIAL PARK
WEYBURN
GRIFFIN
13
STOUGHTON
ARCOLA
CARLYLE
MOOSE MOUNTAIN CR.
RALPH
HALBRITE
39
ROUGHBARK CR.
GOODWATER
MIDALE
JEWEL CR.
LAMPMAN
361
DOUGLASTON
AUBURNTON
DEAD LAKE
MACOUN
SOURIS RIVER
47
ALAMEDA
HITCHCOCK
OXBOW
18
GLEN EWEN
FROBISHER
35
BROMHEAD
18
NOONAN
LONG CR.
TORQUAY
OUTRAM
RAFFERTY
TABLELAND
ESTEVAN
BIENFAIT
SHAND
SOURIS RIVER
8
350
ROCHE PERCÉE
39
NORTH PORTAL

FIGURE 4

SOURIS BASIN DEVELOPMENT AUTHORITY

RAFFERTY / ALAMEDA PROJECTS

RAFFERTY / ALAMEDA DAMS
RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
WILDLIFE - WATERFOWL
LAND CAPABILITY

OTHER ENG. CHECKS
DEPT.
CHK'D BY
DATE
DEPT.
CHK'D BY
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DEPT.
CHK'D BY
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DRAFTING DEPT.
DRAWN BY GMM
CHK'D BY
DATE 87-05-13
SCALE:
DESIGN DIVISION
DEPT.
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DATE

PROP.	UNIT	SYST.	FUNC.	SERIAL	REV.
A436	1	40	RVR	00	A

DEPT	APP'D			DEPT	APP'D			DEPT	APP'D			DEPT	APP'D			DEPT	APP'D		
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			REV.				REV.				REV.				REV.				REV. A

The most extensive nesting habitat is the cattail marsh along the main branch of the Souris above Midale Dam. Elsewhere, suitable habitat is restricted to a narrow band of vegetation along either bank of the Souris River. This habitat, although not extensive, tends to be much better in those areas where the land is cultivated, or hay cropped, rather than grazed. This type of habitat extends from the proposed Rafferty dam site south of McDonald Lake north to approximately the confluence of Roughbark Creek and the Souris River. From this point north, much of the nesting habitat is of poor quality, as cover is absent or very restricted due to grazing. South and east from the McDonald Lake area, particularly east of Estevan, the character of the Souris River and its associated habitat changes. The valley is well-wooded and the density of residential development is relatively high, particularly near Estevan.

Limited waterfowl surveys in 1984 (see Appendix I) were conducted in representative sections of the Souris River between the proposed dam site and the confluence of the Souris River and Roughbark Creek. Due to the differences in river valley morphology upstream and downstream of Midale Dam, sampling effort was divided between these two reaches (Souris Basin Development Authority, Background Report). Because of the lateness of the survey (mid-July) many early broods were likely missed. While a better indicator of potential waterfowl productivity would have involved both pair and brood counts over an extensive area, the limited surveys would have established a minimum estimate of actual productivity in 1984. Production of waterfowl would be expected to be considerably higher in years of greater runoff and precipitation. Due to the limited geographical extent and the lateness of the 1984 survey, additional waterfowl production surveys will be completed in 1987, at locations including McDonald Lake, Dead Lake and portions of Roughbark Creek.

The projected density of duck broods for the reaches upstream of Midale Dam was 1.4 broods/km of river channel (Table 3). The projected density of broods downstream of Midale Dam was considerably higher, amounting to 5.0 broods/km of river channel (Table 3). The projected minimum density of duck broods for the entire survey area was 2.64 broods/km of river (Table 3).

Mallards **(Anas platyrhynchos)** constituted the majority of brood observations (79 percent) although small numbers of American Wigeon **(Anas americana)**, Northern Pintail **(Anas acuta)** and Blue-winged Teal **(Anas crecca)** broods were also encountered. No broods were observed on Dead Lake.

TABLE 3

Summary of Waterfowl Production Estimates
Rafferty Project Area on Souris River System, 1984

Location	Length River Channel (km)	# Duck Broods/ Km River Channel	Total Duck Broods	Total Ducklings
Sampled Area Upstream of Midale Dam	5.0	1.4	7	40
Projected Midale Dam Upstream to Roughbark Creek	25.4	1.4*	36.0*	206*
Projected Roughbark and Jewel Creeks	14.4	1.4*	20.0	115
Projected Souris River upstream from Roughbark Creek	19.5	1.4*	27.0	156
Sampled Area Downstream of Midale Dam	1.6	5.0	8.0	27
Projected Midale Dam downstream to Rafferty Dam Site	31.2	5.0*	156.0*	796*
TOTAL ESTIMATE Within Proposed Reservoir (excluding McDonald and Dead Lakes)	90.5	2.64*	239.0*	1273

*Projected numbers based on data from sampled areas.
Source: Saskatchewan Parks, Recreation and Culture, Unpublished Data

Aggregations of adult waterbirds during summer were largely restricted to Dead Lake, an 8 km long waterbody formed by impounding a side channel of the Souris River. At the time of the mid-July 1984 survey, Dead Lake harboured a minimum of 800 ducks, comprised of Mallards (30 percent), American Wigeon (30 percent), Redheads **(Aythya americana)** (25 percent), with the remaining 15 percent composed of small numbers of Lesser Scaup **(Aythya affinis)**, Northern Pintail, Blue-winged Teal, Gadwall **(Anas strepera)** and Common Goldeneye **(Bucephala clangula)** (Souris Basin Development Authority, Background Report). Most of these ducks were drakes which suggests that Dead Lake constitutes a moulting area for post-breeding and non-breeding birds. The shoreline of this waterbody is largely exposed mud with the exception of a small area of emergent vegetation at the lake's outlet.

During fall, migrating waterfowl congregate in large flocks, using large lakes in preference to the smaller ponds commonly used during spring and summer. The purpose of this field study was to determine use of Dead Lake and the adjacent Souris River by migrating waterfowl. Creelman Slough, a heavily used, regionally important staging marsh for geese, 50 km north of Weyburn, was also surveyed for comparative purposes.

Table 4 provides a summary of waterfowl observed in the Dead Lake and adjacent Souris River area, by species during the limited fall field survey. The majority of birds was observed on Dead Lake, with no birds seen on the main channel of the Souris River and only four Canada Geese **(Branta canadensis)** and six Mallards on a small pond in the marsh between the Souris River and Dead Lake (Souris Basin Development Authority, Background Report). The 55 "other dabbling ducks" observed on Dead Lake included Gadwall and American Wigeon. The only diving ducks were Buffleheads **(Bucephala albeola)**. The 35 Snow Geese **(Chen caerulenscens)** were not actually seen on the water at Dead Lake but were flying along the length of the lake at low altitude early in the morning. This suggests that they had roosted on the water at the north end the previous night. However, in conversation with two hunters at Dead Lake at the time, it was learned that geese occasionally use a small alkali pond located about one km north of Dead Lake.

The few migrant waterfowl recorded at Dead Lake during the mid-October, 1985 survey suggests that the existing smaller waterbodies of the Souris River valley do not attract significant concentrations of migrants despite the

TABLE 4

Summary of mid-October 1984 Aquatic Bird Observations*

Species	Dead Lake and Souris River
Canada Goose (**Branta canadensis**)	4
Snow Goose (**Chen caerulescens**)	35
Mallards (**Anas platyrhynchos**)	80
Other Dabbling Ducks (**Anas spp**)	55
Lesser Scaup (**Aythya affinis**)	16
Bufflehead (**Bucephala albeola**)	5
Double-crested Cormorants (**Phalacrocorax auritus**)	4
American White Pelicans (**Pelecanus erythrorhynchos**)	1

*Source: Souris Basin Development Authority - Background Report fact that southeastern Saskatchewan lies within both the Central Flyway and the Mississippi Flyway, both being major waterfowl migration corridors (Linduska 1964). By comparison, there was a major concentration of geese on Creelman Slough in mid-October. It was conservatively estimated that the 15 km^2 wetland harboured in excess of 50,000 geese; the majority were Snow Geese, with less than 10 percent being Canada Geese and Greater White-fronted Geese (**Chen albifrons**).

During the fall migration period, geese and dabbling ducks, primarily Mallards and Northern Pintails, rest on large waterbodies and fly to grain fields at dawn and again in late afternoon to feed on waste or unharvested grain. These daily flights can exceed 15 km each way but often are shorter if suitable fields are adjacent to or nearby the resting water. Although few such feeding areas occur in the immediate vicinity of the Souris River, McDonald Lake, Dead Lake or the Boundary Dam Reservoir, this is probably not the limiting factor. The surrounding uplands are devoted primarily to unimproved cattle pasture. The overall area seems to be rather unattractive to fall migrants because of the generally restricted expanses of water which do not offer sufficient refuge. If large attractive waterbodies were readily available, the lack of adjacent grain fields would not likely be a significant deterrent to migrants.

In 1985, the New Wildlife Management Zone (15), which includes the proposed Rafferty Reservoir, ranked last amongst all 16 Farmland Zones in southern Saskatchewan in terms of ducks harvested per unit area (0.26 ducks/km^2 or 1.16 percent of the provincial harvest). This compares to 0.69 ducks/km^2 for all Farmland Zones and 0.59 ducks/km^2 for all 17 Parkland Zones. Zone 32, within which the Alameda Reservoir is proposed, recorded even a lower duck harvest in 1985; (0.14 birds/km^2) this was 0.29 percent of the Provincial duck harvest.

Wildlife Management Zones 15 and 32 represented 0.88 and 0.05 percent of the provincial goose harvest in 1985, respectively. The harvest was 0.23 geese/km^2 in Zone 15 and 0.03 geese per km^2 in Zone 32. This compares to an average harvest of 0.93 birds/km^2 in all Farmland Zones and 0.41 birds/km^2 in all Parkland Zones.

Based upon the Canada Land Inventory, limited field investigations and duck or geese harvests per unit area, it can be reasonably concluded that the Rafferty Project Area is of minimal importance in the region as a feeding and resting area for fall-migrating waterfowl. The major detracting feature is the lack of extensive waterbodies for refuge.

ii) Upland Game Birds

Introduction

Four species of upland game birds occur within the the Study Area. Sharp-tailed Grouse are the most abundant and were observed throughout the Study Area (Souris Basin Development Authority, Background Report). The Gray or Hungarian Partridge are also reported to be common (Stelfox 1979) although only a few flocks were observed during field surveys. Ring-necked Pheasants are common in localized areas; numbers do not appear to have declined in the Rafferty Project Area. Annual stocking by Saskatchewan Parks, Recreation and Culture was discontinued in 1983. The Estevan Branch of the Saskatchewan Wildlife Federation does, however, continue to stock birds in the vicinity of Estevan. Ruffed Grouse (**Bonasa umbellus**) are uncommon due to a lack of suitable habitat.

Ring-necked Pheasant

The 1985 Ring-necked Pheasant survey was designed to meet two objectives in order to evaluate the importance of the Rafferty Project Area to the pheasant population in the region:

i) to select a pheasant survey route within the Study Area for which there was some historical data for comparison purposes; and

ii) to complete a Ring-necked Pheasant survey in the less favourable habitat in the northern portion of the Study Area and another in the apparently better habitat in the southeastern portion of the Study Area.

Two areas were selected for these surveys: one route ran south along the Souris from just below the new Nickle Lake Spillway (Figure 5, Route 1) to a point just north of the Dr. Mainprize Regional Park. The second route was a duplication of breeding population surveys route known as "Estevan East". The Wildlife Branch carried out surveys in this area in 1970, 1972, 1973, 1974, 1976 and 1978. Survey methodologies are described in Appendix I. In a general sense, survey methodology involves enumerating numbers of birds by their vocalizations (crowings) in a standardized period of time to obtain an index of relative abundance (crowings/stop).

There is considerable variation in the survey results on an annual basis from a high of 4.9 crowings/stop in 1972 to a low of 0.06 in 1976. The

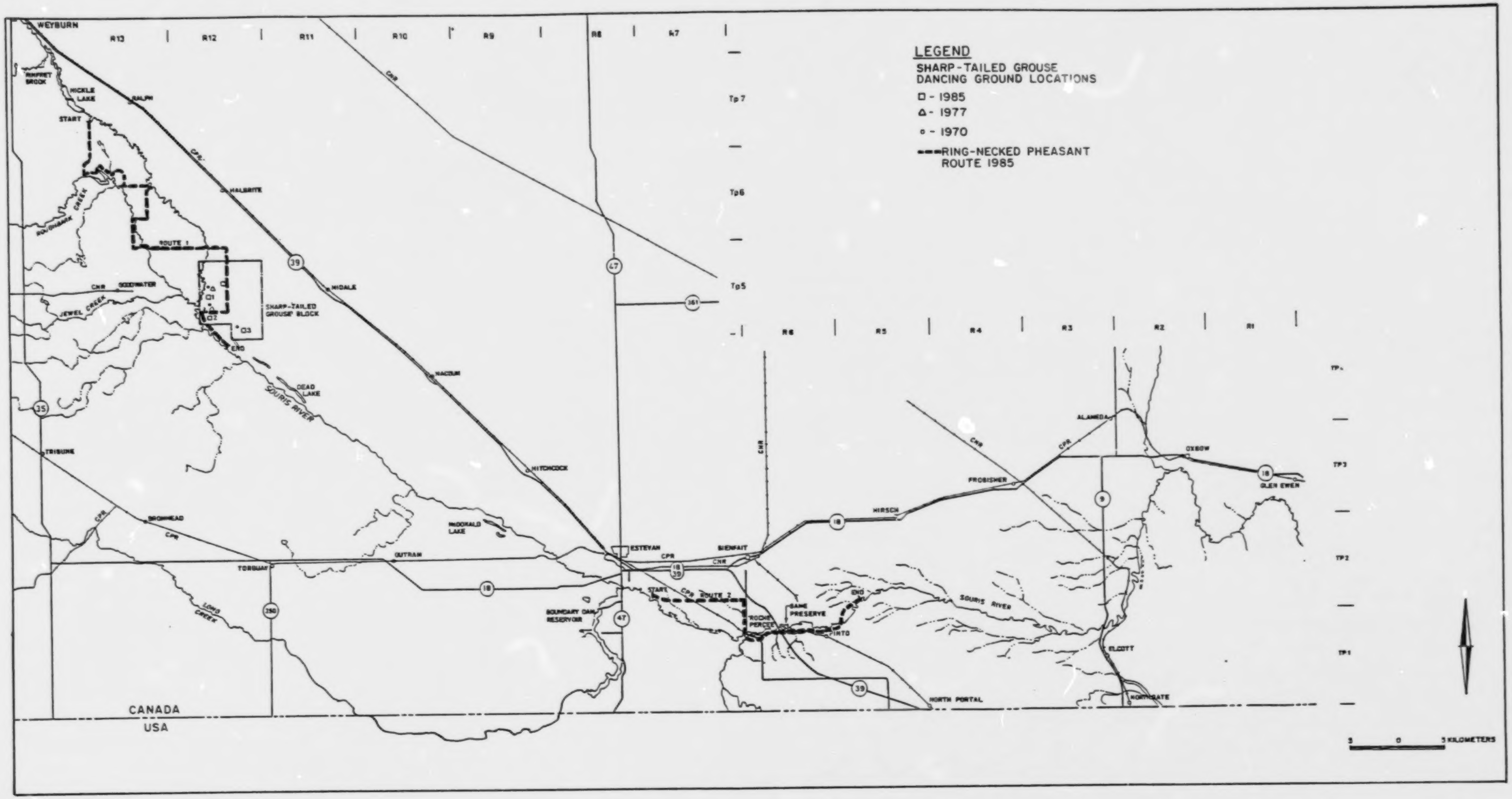

WEYBURN
R13
R12
R11
R10
R9
R8
R7
Tp 7
Tp6
Tp5
LEGEND
SHARP-TAILED GROUSE DANCING GROUND LOCATIONS
□ - 1985
△ - 1977
◦ - 1970
RING-NECKED PHEASANT ROUTE 1985
RINFRET BROOK
NICKLE LAKE
RALPH
START
CPR
HALBRITE
ROUGHBARK CREEK
ROUTE 1
39
MIDALE
CNR
GOODWATER
JEWEL CREEK
SHARP-TAILED GROUSE BLOCK
□1
□2
□3
END
DEAD LAKE
SOURIS RIVER
MACOUN
47
361
35
TRIBUNE
HITCHCOCK
BROMHEAD
CPR
McDONALD LAKE
OUTRAM
TORQUAY
18
LONG CREEK
350
ESTEVAN
CPR
CNR
BIENFAIT
18
39
START
CPR
ROUTE 2
BOUNDARY DAM RESERVOIR
47
ROCHE PERCEE
GAME PRESERVE
END
PINTO
SOURIS RIVER
39
NORTH PORTAL
R6
R5
R4
R3
R2
R1
CNR
ALAMEDA
CPR
OXBOW
18
GLEN EWEN
FROBISHER
HIRSCH
9
ELCOTT
NORTHGATE
TP4
TP3
TP2
TP1
CANADA
USA
5 0 5 KILOMETERS

FIGURE 5
LOWER SOURIS RIVER
RING-NECKED PHEASANT
SURVEY ROUTE AND
UPLAND GAME BIRD
SURVEY LOCATIONS

average during the 11 years of surveys was 2.15 (Table 5). This value is considerably higher than those recorded on either survey route in 1985 (Table 6). Ring-necked Pheasant populations are affected significantly by climatic conditions. In most years, severe winter conditions are the primary limiting factor in the region (Stelfox 1979). The severe 1984-85 winter likely contributed to the below average crowings/stop in both survey areas. In recent years, it is also likely the severe drought conditions in the region have restricted birds to habitat bordering the river because of a lack of permanent waterbodies and associated vegetative cover on the surrounding prairie.

Population levels were found to be below recorded historical levels in both areas surveyed. A conscious effort was made during the survey of the Weyburn South route to stop in areas of suitable habitat (Souris Basin Development Authority, Background Report). This has made the population numbers appear better than they probably are based upon the crowings/stop index. Based on the crowings/stop comparison, the Estevan East route area may support slightly more Ring-necked Pheasants than the Weyburn South route. Another variable in this determination is the fact that much of the land along the Weyburn route is utilized as grazing land, with poor cover availability and no evidence of restrictions on hunting. By comparison, a greater proportion of the Estevan East Route is devoted to rural residential development, much is cultivated and hunting is not permitted on many tracts of land. "No Hunting" signs were visible at 8 of the 18 survey stops, one of which included a game preserve. A subjective visual comparison of the two regions suggested that the habitat along the Souris Valley south to Estevan is marginal for Ring-necked Pheasant except for a few isolated pockets. The Estevan East area also provides good quality habitat. According to Kimball et al. (1956) the best pheasant habitat occurs where 50 to 75 percent of the land is under cultivation, with the remaining non-agricultural lands supporting a diversity of cover such as shelterbelts, slough margins, willow thickets, sweet clover and other weeds. The mix of land is important as the agricultural land provides food while the non-cultivated land provides nesting, brood and winter cover (Stelfox 1979).

The Saskatchewan Ring-necked Pheasant population is highly variable (Stelfox 1979) and the birds are relatively short lived; even in the absence of hunting, annual losses may approach 70 percent. The surveys conducted in 1985 revealed the numbers in this region to be considerably below the 19 year average

TABLE 5

Ring-necked Pheasant Breeding Population Surveys, Estevan East Survey Area

Year	Survey Stops	Total Crowings	Average/Stop
1963	20	7	0.4
1967	20	44	2.2
1968	20	24	1.2
1969	20	36	1.8
1970	17	53	3.1
1971	20	78	3.9
1972	20	98	4.9
1973	21	75	3.6
1974	17	11	0.6
1976	16	1	0.06
1978	20	27	1.4
TOTAL	211	454	2.15

SOURCE: Saskatchewan Parks, Recreation and Culture, Unpublished Data.

TABLE 6

Ring-necked Pheasant Breeding Population Surveys 1985

Date	Survey Area	Survey Stops	Distance km	Total Crowings	Average Crowings /km	Average Crowings /Stop
85/04/24	Weyburn South	11	49.4	5	0.1	0.4
85/05/01	Weyburn South	11	49.4	9	–	0.8
85/05/02	Estevan East	18	29.7	17	–	0.9
85/05/03	Estevan East	18	28.0	13	0.5	0.7

Source: Souris Basin Development Authority, (Background Report).

figure of 2.1 crowings/stop reported by Stelfox (1979). He attributed reductions in resident populations to cleaner farming practices and overall habitat deterioration. It is reasonable to assume that the extended drought condition which has existed in recent years has caused further habitat deterioration of preferred riparian habitat in southern Saskatchewan.

The Study Area, which includes both reservoir sites, lies within one of the most important regions of the Province from a Ring-necked Pheasant hunting perspective. In 1983 for example, the Wildlife Management Zone (7) incorporating the Study Area accounted for 18 percent of the Province's harvest and ranked third overall among Wildlife Management Zones in terms of harvest per km^2 (Saskatchewan Parks and Renewable Resources 1984). In 1984, the new Wildlife Management Zone (15) that incorporated the proposed Rafferty Reservoir again ranked third in terms of number of birds harvested per unit area (0.23 birds/km^2).

Sharp-tailed Grouse

The Sharp-tailed Grouse is indigenous and remains the most abundant upland game bird within the Study Area. The native grassland and shrub vegetation bordering the Souris River valley and virtually all of the areas within the Midale, Lomond #1, and Estevan-Cambria Community Pastures are considered critical habitat for this species. Noble and Flory (1978) estimated that some of these areas may support in excess of 40 Sharp-tailed Grouse/km^2 prior to hunting season and winter mortality.

Sharp-tailed Grouse breeding population surveys have not been carried out annually in the Study Area although some survey records pertinent to the Study Area go back twenty years. The historical data demonstrate significant variation due mostly to weather. The spring, 1985 Survey Area resembled the areas previously evaluated by Provincial Wildlife Staff (Souris Basin Development Authority, Background Report) (Figure 5). Agricultural practices have probably changed as areas along the north and east sides of the survey block which were once pasture are now under cultivation, making them less suitable for breeding purposes. The 1985 survey of total birds on the dancing grounds are within the historical extremes (Table 7).

Saskatchewan Parks, Recreation and Culture Wildlife Branch has annual survey records of the numbers of breeding males on a per unit area basis for the Goodwater Survey Block and useful survey data for four other survey blocks along the Souris River (Table 8) (Figure 6).

TABLE 7

Sharp-tailed Grouse Breeding Population Surveys, Halbrite-Midale.

Year	Area Surveyed (km^2)	Number of Dancing Grounds	Males	Females	Flush Count	Breeding Males/ km^2
1967	50	5	12	24	43	0.24
1970	50	5	10	14	30	0.20
1971	50	5	6	12	24	0.12
1973		5	0	0	0	-
1976	50	2	-	-	50	-
1976			17	9	50+	0.34
1976			-	-	21	-
1976			29	7	53	1.58
1977	55		-	-	64	-
1985	45	4	46	16	61	1.02

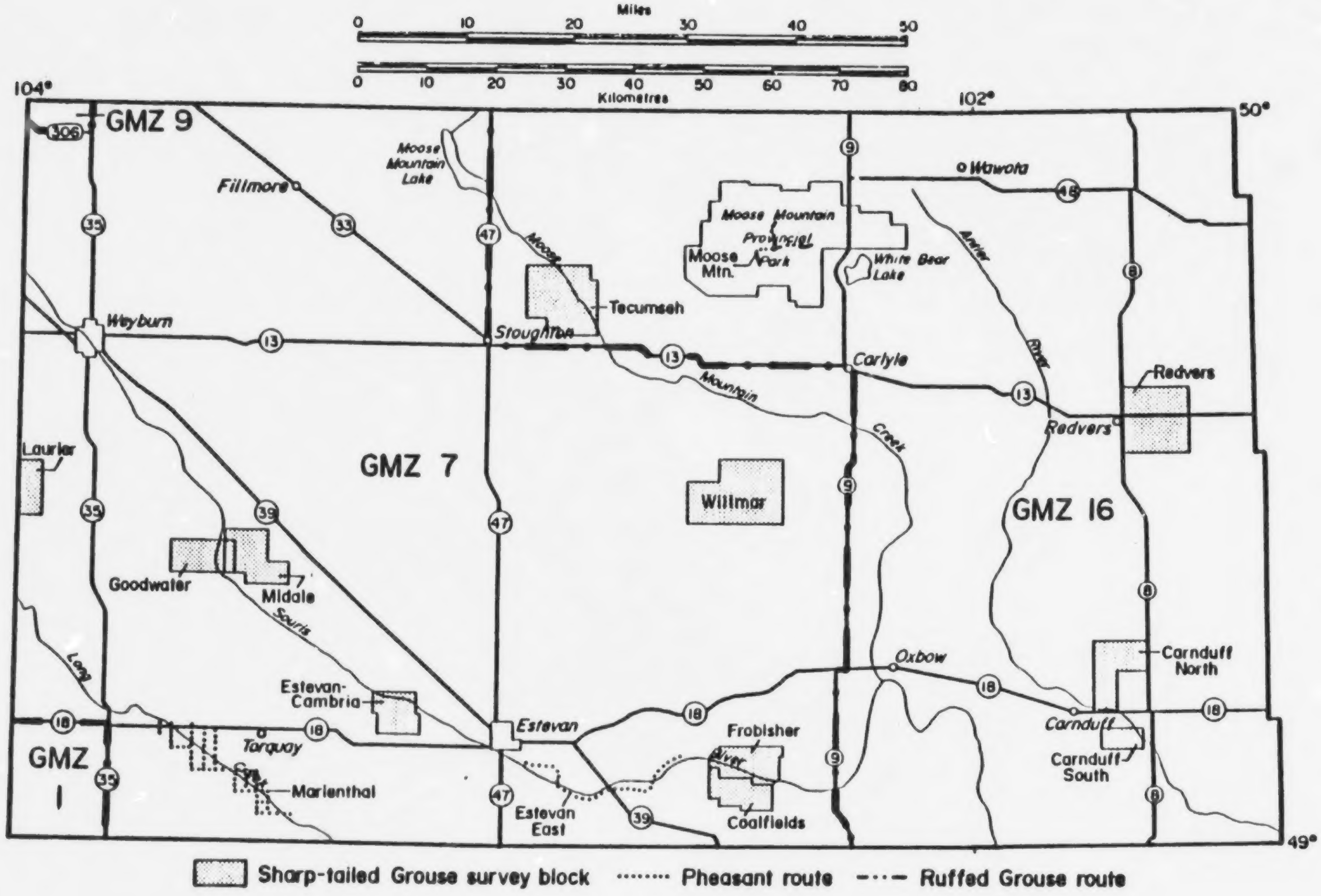
Sources: Saskatchewan Parks, Recreation and Culture
Souris Basin Development Authority, Background Report

TABLE 8

Sharp-tailed Grouse Breeding Males/km^2

Year	Goodwater Block	Estevan-Cambria Block	Midale Block	Coalfield Block	Frobisher Block
1970			0.59		
1971			1.02		
1972					
1973					4.64
1974					2.22
1975					1.78
1976			1.00		
1977		9.92	1.13		
1978	6.73			1.29	
1979	6.80	6.25			
1980	6.68	4.49			
1981	3.39	2.17			
1982	1.58				
1983	2.69				
1984	3.69				
1985	2.21	1.51			
1986	3.21	1.66			
1987	5.53	-			

Sources: Saskatchewan Parks, Recreation and Culture


Miles
0
10
20
30
40
50
0
10
20
30
40
50
60
70
80
Kilometres
104°
102°
50°
49°
GMZ 9
GMZ 7
GMZ 16
GMZ 1
306
35
33
47
13
9
48
8
39
18
Fillmore
Moose Mountain Lake
Moose
Tecumseh
Moose Mountain Provincial Park
Moose Mtn.
White Bear Lake
Wawota
Antler
River
Weyburn
Stoughton
Carlyle
Mountain
Creek
Redvers
Laurier
Willmar
Goodwater
Midale
Souris
Long
Estevan-Cambria
Torquay
Marienthal
Estevan
Estevan East
Frobisher
River
Coalfields
Oxbow
Carnduff
Carnduff North
Carnduff South
▨ Sharp-tailed Grouse survey block
······· Pheasant route
-·-·- Ruffed Grouse route

Historical upland game bird survey areas.

FIGURE 6

Source: Saskatchewan Tourism & Renewable Resources
- Wildlife Technical Report 79-6; H.A. Stelfox

The Goodwater and Estevan-Cambria survey areas are in relatively good Sharp-tailed Grouse habitat and may be more representative of the Rafferty Project Area than the Midale or two other downstream blocks (SPRC pers. comm.). As shown in Table 8 the number of breeding males varies considerably from year to year within survey blocks as well as among survey blocks. Within the past ten years the number of breeding males/km^2 at Goodwater has ranged from a high of 6.80 in 1979 to a low of 1.58 in 1982. The 1987 survey at 5.53 suggests a return to former higher levels. The number of breeding males in the Estevan-Cambria block appears to have varied similarly from a high of 9.92 males/km^2 in 1977 to a low of 1.51 and 1.66 males/km^2 in 1985 and 1986 respectively.

For comparison purposes, in 1985, the number of males/km^2 in the Goodwater Survey block was third highest in the Province when the Saskatchewan average was 1.56 males/km^2. In 1986, the Goodwater Survey Block ranked fourth in the province when the Provincial average was slightly higher at 1.88 males/km^2 (SPRC Game Management 1985-86).

The historical Wildlife Management Zone (7) that incorporated the Study Area accounted for 10-12 percent of the 1983 Provincial harvest and ranked within the top five Sharp-tailed Grouse Wildlife Management Zones in terms of harvest per km^2. In 1984, the new Wildlife Management Zone which includes the proposed Rafferty Reservoir ranked third in the Province in terms of birds harvested per unit area (0.486 birds/km^2).

The importance of the natural grasslands within and adjacent to the Souris River Valley to Sharp-tailed Grouse is readily apparent, however there is insufficient knowledge about seasonal movements to, from and within the Valley. In order to better understand the ecology of Sharp-tailed Grouse and better evaluate the impact of the Rafferty and Alameda Projects on birds within or near the Souris Valley, and Moose Mountain Creek, a three year research project is proposed by the Authority. This investigation will involve radio telemetry to track the fall and winter movements and habitat utilization of 100 Sharp-tailed Grouse in the upper Souris Valley. This research has been estimated to cost the Authority $93,500 (SPRC 1987).

Gray Partridge

Gray Partridge are widely distributed in the farmland areas as they require less natural vegetation and tolerate more intensive cultivation than other upland gamebird species. Stelfox (1979) identifies the most important habitat within this region as a triangle formed by Weyburn, Estevan and Stoughton, lying east of the Rafferty Project Study Area.

Several broods of Gray Partridge were observed within the Study Area during 1984 field studies (Souris Basin Development Authority, Background Report). These birds were invariably near uncultivated areas which were adjacent to cereal grain crops. Sightings were on the prairie, to the east of the Souris River valley, which constitutes good partridge habitat. Gray Partridge were not seen in the valley itself although they could be expected to occur there in low numbers. The heavy grass and shrub cover in the valley would provide winter shelter for Gray Partridge during severe weather.

The historical Wildlife Management Zone (7) that incorporated the Study Area accounted for approximately 10 percent of the 1983 Provincial harvest and that zone was ranked fifth overall in terms of harvest per km^2. In 1984, the new Wildlife Management Zone incorporating the Rafferty Reservoir ranked fourth Provincially in terms of harvest per unit area (0.62 birds/km^2).

Ruffed Grouse

Suitable habitat for Ruffed Grouse is primarily restricted to the northeast portion of the Study Area where the best habitat occurs, within the Moose Mountain Upland and well wooded slopes of the Pipestone Creek Valley (Stelfox 1979). Few, if any Ruffed Grouse are likely to inhabit the upper reaches of Souris River Valley within the Rafferty Project Area. Surveys were therefore not conducted to census Ruffed Grouse.

Due to the paucity of habitat, little effort is devoted to hunting Ruffed Grouse in this region of the Province.

iii) Raptors

This group of birds has been the object of considerable concern during the past decade or two because pesticides and loss of habitat have significantly reduced the populations of some species. Stelfox (1979) recorded ten species as breeding in southeastern Saskatchewan including: Swainson's Hawk, Ferruginous Hawk, Northern Harrier (**Circus cyaneus**), American Kestrel (**Falco sparverius**), Merlin (**Falco columbarius**), Broad-winged Hawk (**Buteo platypterus**), Red-tailed Hawk (**Buteo jamaicensis**), Cooper's Hawk (**Accipiter cooperii**), Sharp-shinned Hawk (**Accipiter striatus**) and the Turkey Vulture. This last species is probably only rarely found within the Study Area. Ferruginous Hawks and Burrowing Owls are both threatened species (COSEWIC 1986).

Numerous raptors were recorded during field surveys in the Project Area during 1984 (Souris Basin Development Authority, Background Report). Swainson's Hawks and Red-tailed Hawks were the most numerous species seen. Great Horned Owls (**Bubo virginianus**) were recorded in the more wooded reaches of the upper Souris River valley. Golden Eagles were noted during the fall migration period near Dead Lake and Weidl (1985) encountered a dead bird in May, 1980 on the banks of the Souris River between Roche Percee and the highway directly north of North Portal. Saskatchewan Parks, Recreation and Culture personnel reported Golden Eagles within or adjacent to the Souris Valley within the Project Area during various winter aerial surveys for deer.

Although the Burrowing Owl is known to be a breeding species in the project region (Gollop 1969, Salt and Salt 1976) no evidence of these birds was recorded during field activities in 1984 or 1985. A brood of Burrowing Owls had been noted within the Lomond #1 PFRA Pasture in 1978 (Flory 1978). Weidl (1985) also encountered a Burrowing Owl in May, 1978 on the section of the Souris River between Roche Percee and Highway 9, south of Oxbow.

The Ferruginous Hawk is dependent upon large blocks (greater than 5 km^2) of native and tame grassland which support abundant rodent populations, and where few clumps of trees are available for nest sites. The Study Area is the most easterly breeding range of this species in Saskatchewan (Stelfox 1979). Community pastures appear to meet the needs of Ferruginous Hawks as a number of scattered nesting sites were reported on the uplands within or adjacent to pasture areas in 1986 (SPRC, pers. comm.).

iv) Other Birds

Shorebirds, Gulls, Grebes, Herons and Pelicans

A wide variety of the above groups of birds might be expected to frequent the Study Area. Seven species of wading birds were encountered during 1984 and 1985 field studies. The American Avocet (**Recurvirostra americana**), Long-billed Curlew (**Numenius americanus**), Marbled Godwit (**Limosa fedoa**) and Willet (**Catoptrophorus semipalmatus**) are common residents of grassland areas in southern Saskatchewan. The remaining species of wading birds, the Spotted Sandpiper

(**Actitis macularia**), the Lesser Yellowlegs (**Tringa flavipes**) and the Killdeer (**Charadrius vociferus**) are very common throughout Saskatchewan where suitable habitat exists.

Three species of gulls, the Herring Gull (**Larus argentatus**), the Ring-billed Gull (**Larus delawarensis**) and Franklin's Gull (**Larus pipixcan**) are common and widely distributed in Saskatchewan and were observed in the Study Area.

One species of grebe, the Western Grebe (**Aechmophorus occidentalis**), was observed in small numbers at Dead Lake. The Horned Grebe (**Podiceps auritus**) is probably the most common and widely distributed species of grebe in North America but it was not observed.

The Double-crested Cormorant (**Phalacrocorax auritus**) is relatively common within the central plains region of North America. Thirteen birds of this species were observed on Dead Lake during mid-July 1984 field surveys (Souris Basin Development Authority, Background Report). Weidl (1986) reported observing two Double-crested Cormorants in May, 1985 on a portion of the Souris River near Oxbow.

Two species of herons frequent the Study Area but due to the secretive nature of these birds they were observed less than might be expected given their broad distribution. Both the Great Blue Heron (**Ardea herodias**) and the Black-crowned Night-Heron (**Nycticorax nycticorax**) were observed but neither is considered abundant within the Study Area. Weidl (1985, 1986) reported Great Blue Herons along the Souris River between Roche Percee and Highway #9 in May of 1978 and 1985. The same author observed a Black-crowned Night-Heron in the same section of the Souris River in May, 1978.

Flocks of American White Pelicans (**Pelecanus erythrorhynchos**) were regularly observed feeding at Dead Lake and along the Souris River upstream of Midale Dam; 33 American White Pelicans were observed in Dead Lake during a mid-July, 1984 survey (Souris Basin Development Authority, Background Report). Suitable breeding habitat for this species is not available in the Study Area.

Perching Birds

The variety of cover types which exist within the Study Area provide habitat for approximately 61 species of perching birds (Blood **et al.** 1976). Many of these species are confined to "islands" of habitat such as wet meadows and farmsteads which provide vegetative diversity (Barber 1981) in extensive areas of cultivated land and rangeland. Status varies from occasional migrant to common seasonal occupant to common summer resident. An annotated list of bird species within this region is provided by Blood **et al.** (1976), and Weidl (1985, 1986) provide some additional, more recent observations as well. It is currently not known to what extent the Souris River Valley is used as an invasion route or a migration corridor for perching or other birds. Additional baseline field surveys in 1987 will attempt to address this issue.

4 MAMMALS

i) Small Mammals

Blood **et al.** (1976) reported seven species of small (microtine) rodents in the Souris Basin of which the most common species was the deer mouse (**Peromyscus maniculatus**). Banfield (1974) and Richards and Fung (1969) identify one additional shrew species, two additional voles and one species of jumping mouse as being indigenous to the Study Area.

The most important habitat for this group of animals is uncultivated area, including abandoned farmsteads, wetlands and rangelands. The relative abundance of small mammals on haylands and intensively farmed grainlands was significantly lower. The edge areas where farmlands and native vegetative cover come together support an abundance of small mammals. Unusual species found in the Study Area include the olive-backed pocket mouse (**Perognathus fasciatus**), the northern grasshopper mouse (**Onychomys leucogaster**) and prairie vole (**Microtus ochrogaster**) (Blood **et al.** 1976). They are rare within the Study Area because this represents the edge of their range and because each has very specialized habitat requirements in grassland areas (unlike a species such as the deer mouse). Two species, the Norway rat (**Rattus norvegicus**) and the house mouse (**Mus musculus**) have been introduced from Europe.

Three species of lagomorphs (rabbits and hares) were recorded by Blood et al. (1976), although Richards and Fung (1969) indicate that the Study Area incorporates the western extremity of the range for a fourth species, the eastern cottontail (**Sylvilagus floridanus**). The most common species is the white-tailed jack rabbit. Nuttall's cottontail (**Sylvilagus nuttallii**) were reported to frequent habitat provided by the shrubby coulees, while snowshoe hare were concentrated in cover provided by farmsteads and shelter belts (Blood et al. 1976).

Three species of ground squirrel are found in the Study Area. Richardson's ground squirrel is abundant in the heavily grazed grasslands. The thirteen-lined ground squirrel (**Spermophilus tridecemlineatus**) occupies well vegetated upland sites, with scattered shrub growth and also along roadways in uncultivated ditch areas. Franklin's ground squirrel (**Spermophilus franklinii**) frequents areas of grasses and herbs near open wooded areas or marsh edges. The Study Area is at the western edge of this species' range in Saskatchewan.

These species are important within the Study Area as they are the primary consumers, and as such, are an important food source for many avian and mammalian predators.

ii) Furbearers

Semi-aquatic furbearers were the most commonly encountered mammals during 1984 and 1985 field surveys (Souris Basin Development Authority, Background Report). Above Midale Dam, on the Souris River where water levels are relatively stable and deep water is available, there was substantial evidence of bank-dwelling beavers and some evidence of muskrat (op. cit.). The abundance of riparian deciduous trees and the general paucity of emergent vegetation upstream of Dr. Mainprize Regional Park makes this area much more attractive to beaver than to muskrat; below the park, the marsh type habitat, which includes extensive areas of cattail (**Typha sp.**) provides better muskrat habitat. Little evidence of beaver was seen along the Souris River below the Midale Dam but bank-dwelling muskrats were very common. No systematic surveys were conducted for furbearers in riparian habitat along the Souris River, although undoubtedly the greatest numbers were to be found there. Mink were not observed but can be expected in riparian areas where they prey upon muskrats, smaller rodents, fish and aquatic invertebrates. Additional baseline data on the current populations of mink, muskrat and beavers within the Rafferty Project Area will be obtained through field surveys in 1987.

Terrestrial furbearers in the Study Area include coyote, badger, long-tailed weasel (**Mustela frenata**), red fox, striped skunk and raccoon (**Procyon lotor**) (Richards and Fung 1969). Only coyotes, foxes and weasels were observed during field studies although there was ample evidence of the activities of the other species within and nearby the Project Area. The majority of this evidence was derived from uncultivated prairie and riparian habitats (Souris Basin Development Authority, Background Report).

iii) Ungulates

The white-tailed deer is the predominant ungulate species in the region. This species was first noted in the region during the 1900-1920's period (Bird 1961) and has adapted well to the habitat mosaic of farm crops, aspen bluffs in the prairie and rough wooded cover in coulees and major river valleys. In coulees and major river valleys. In southeastern Saskatchewan, mule deer occur only sporadically. Pronghorn are scattered over the prairies south and west of the Souris River.

Winter ungulate population survey data are available from 1976, 1977 and 1982 (Saskatchewan Parks, Recreation and Culture), and 1985 (Souris Basin Development Authority, Background Report) for portions of the Project Area, which extends upstream from Estevan along the Souris River to an area southwest of Halbrite and includes the lower reaches of Roughbark and Jewel Creeks. Concentrations of wintering deer were found in the following locales:

i) Souris River valley near the confluence with Roughbark Creek, as well as the lower reaches of Roughbark Creek and Jewel Creek;
ii) the poplar grove at Dr. Mainprize Regional Park;
iii) McDonald Lake, and in the valley of the Souris River, upstream of Estevan.

Table 9 presents the results of aerial deer surveys for each of the above areas for the period of record.

It is to be noted that none of these block surveys covered the entire Rafferty Reservoir area, hence it is only possible to make approximate projections of white-tailed deer populations. With recent mild winters it has not been possible for the Authority to improve upon such projections using more up to date or extensive aerial surveys of the actual area to be affected by the project.

Saskatchewan Parks, Recreation and Culture wildlife biologists made an estimate of the number of white-tailed deer which might have been directly affected by the Rafferty project by extrapolating directly from the January 26, 1977 observations made within the community pasture survey blocks and adjacent areas (Table 10). Figure 7 illustrates the approximate flight path for this survey, with observations noted. This estimate suggested that 1,162 white-tailed

TABLE 9

Estimated White-tailed Deer Population Directly Associated with the Rafferty Dam Project Area**

Survey Block	Survey Area (Mi^2)	Observed W.T. Deer	Density Deer/mi^2	Total Area (mi^2)	Winter Population
Estevan-Cambria P.F.R.A. Pasture	6.5	111	17.1	11.0	188
Souris River, Dead Lake to Estevan-Cambria P.F.R.A. Pasture	6.0	84	14.0	6.0	84
Uplands-Souris River Dead Lake to Estevan-Cambria P.F.R.A. Pasture	.0	-	17.1*	25.0	428
Midale-S.D.A. Community Pasture	13.5	89	6.6	27.6	182
Junction of Roughbark, Jewel & Souris River	3.0	115	38.0	3.0	115
Upstream from Roughbark/ Jewel/Souris Junction	0	-	14.0*	11.8	165
TOTALS:	29	399	13.75	84.4	1162

* Estimates Based on Habitat similarities with known deer density areas.

** All Data (Densities) based on aerial transect survey flown on January 26, 1977 (Weins & Barber) under moderate winter conditions, including complete snow cover.

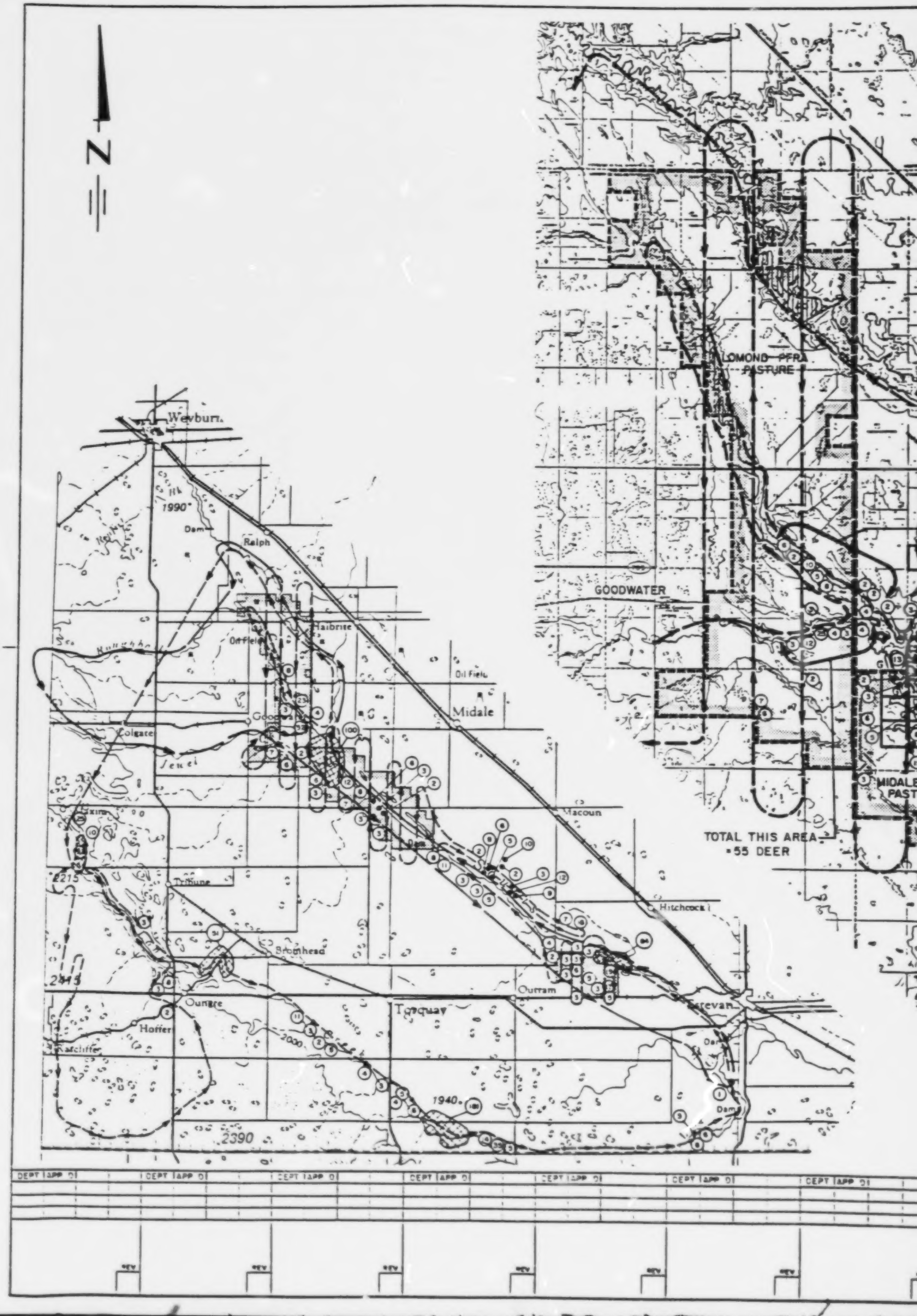
Source: Saskatchewan Parks, Recreation and Culture

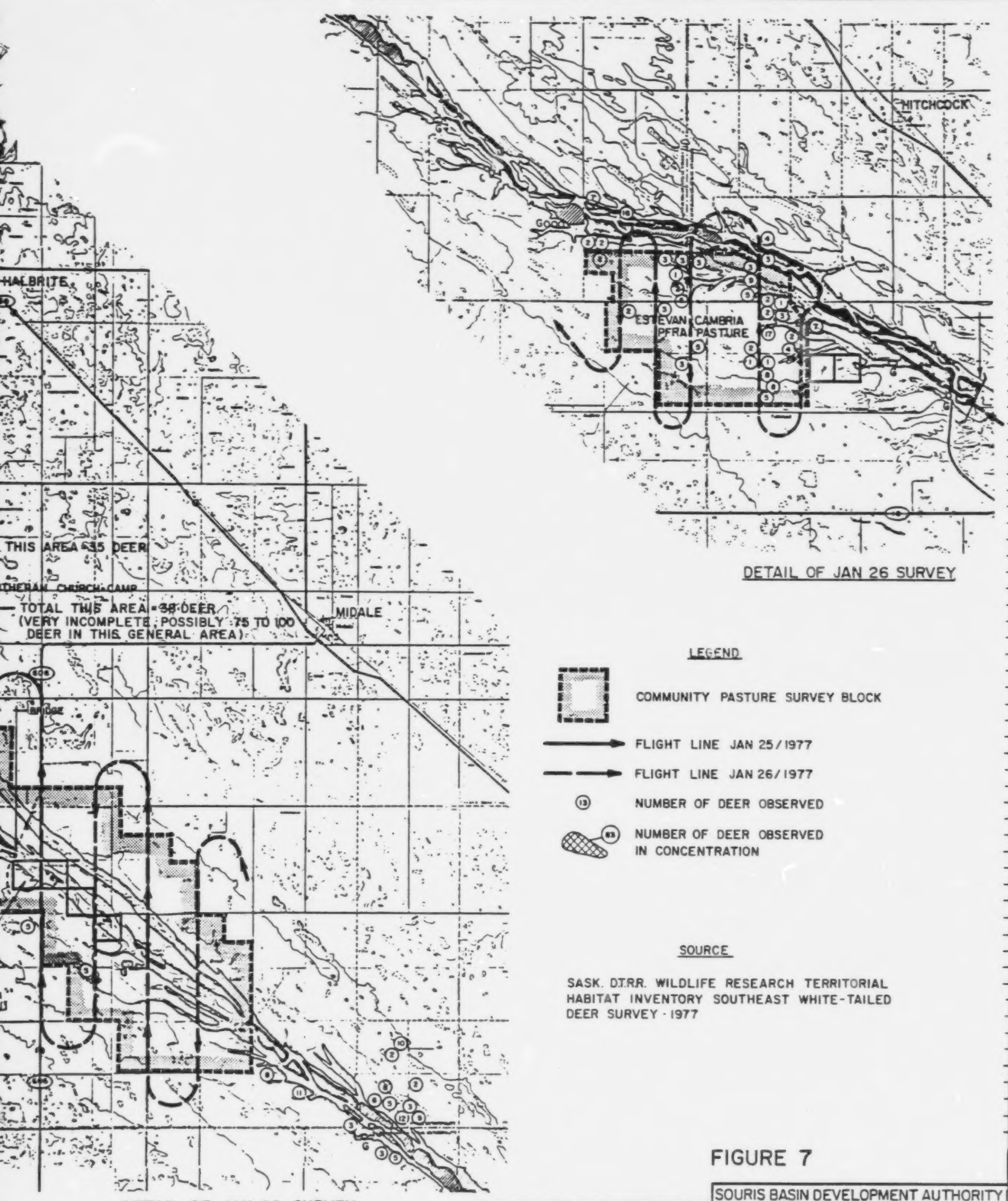
TABLE 10

Estimates of Wintering Populations of White-tailed Deer Along the Souris River and Tributaries in and below the Rafferty Project Area

Area or Coverage	Date	# White-tailed Deer Observed	Comments
AREA A - Estevan-Cambria PFRA Community Pasture			
1 aerial pass SE-NW	Feb. 13/76	None Reported	
5 N-S Transects	Jan. 26/77	117 within pasture & 30 within 1 mi North of pasture	Associated with Souris and McDonald Lake but many in uplands as well
2 aerial passes; 1 dwn; 1 up	March 5/85	None observed	
AREA B - Midale S.D.A. Community Pasture			
1 aerial pass	Feb. 13/76	75	
Boundary & 1 pass up Souris V.	March 24/76	108 in Sec 5-5-12-W2	
9 N-W transects	Jan. 26/77	89 within pasture 31 within 1 mi of pasture	Most deer associated with Souris in NW portion of the pasture.
2 aerial passes; 1 dwn; 1 up	March 5/85	12 in valley	
AREA C - Lomond #1 PFRA Community Pasture			
1 aerial pass	Feb. 13/76	18	
Boundary and up Roughbark and down Souris Valley	Mar. 24/76	23 in Section 13-6-13-W2	
4 N-S transects	Jan. 26/77	105 (12 of which were just portions outside boundary)	Most associated with Jewel & Roughbark Crk up to 3 mi from Souris River
2 aerial passes	Mar. 5/85	5 deer in valley	
AREA D - Souris Valley Downstream to U.S. Border			
Coalflds PFRA Comm Pas. 2 passes E-W & W-E along Souris	Feb. 13/76	217	
S.R. Estevan to U.S. border (count left side plane only)	Jan. 25/77	204	
S.R. Glen Ewen to Roche Percee travelling West	Jan. 25/77	130	

Sources: 1976, 1977 data Saskatchewan Parks, Recreation and Culture
1985 data, Souris Basin Development Authority, (Background Report).


N
Weyburn
1990'
Dam
Ralph
Halbrite
Oil Field
Oil Field
Midale
Goodwater
Colgate
Souris
Macoun
Tribune
2215
Bromhead
Hitchcock
2415
Outram
Torquay
Estevan
Oungre
Hoffer
Ratcliffe
2000
1940
2390
Dam
LOMOND PFRA PASTURE
GOODWATER
TOTAL THIS AREA =55 DEER
MIDALE PAST
DEPT
APP D
REV


HITCHCOCK
ESTEVAN PFRA
CAMBRIA PASTURE
HALBRITE
THIS AREA = 35 DEER
THERAN CHURCH CAMP
TOTAL THIS AREA = 38 DEER
(VERY INCOMPLETE, POSSIBLY 75 TO 100
DEER IN THIS GENERAL AREA)
MIDALE

DETAIL OF JAN 26 SURVEY

DETAIL OF JAN 26 SURVEY

LEGEND

- ▨ COMMUNITY PASTURE SURVEY BLOCK
- ⟶ FLIGHT LINE JAN 25/1977
- – – ⟶ FLIGHT LINE JAN 26/1977
- ⑬ NUMBER OF DEER OBSERVED
- ▨ (63) NUMBER OF DEER OBSERVED IN CONCENTRATION

SOURCE

SASK. D.T.R.R. WILDLIFE RESEARCH TERRITORIAL HABITAT INVENTORY SOUTHEAST WHITE-TAILED DEER SURVEY - 1977

FIGURE 7

SOURIS BASIN DEVELOPMENT AUTHORITY

RAFFERTY / ALAMEDA PROJECTS

RAFFERTY DAM
RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
WHITE-TAILED DEER SURVEY

OTHER ENG. CHECKS	DRAFTING DEPT
DEPT CHK'D BY DATE	DRAWN BY MTS CHK'D BY DATE 87-03-26
DEPT CHK'D BY DATE	SCALE DESIGN DIVISION
DEPT CHK'D BY DATE	DEPT DESIGNED BY CHK'D BY
DEPT CHK'D BY DATE	APP'D BY DATE

PROJ	UNIT / SYST	FUNC.	SERIAL	REV
A 4 3 6	1 4 0	R V R		A

deer and approximately 50 mule deer may have been associated with the Souris River Valley, Roughbark and Jewel Creek valleys at that time.

The Authority had little confidence in these initial estimates since, in addition to being ten years old, they are largely theoretical. One-half of the 1,162 deer estimate was drawn from a density of deer acquired from 8,000 acres in the survey blocks which was then extrapolated to provide a projection for 23,500 acres. Further, as the McDonald Lake area within and adjacent to the Estevan-Cambria PFRA Pasture from which the data were drawn contains some of the best natural white-tailed deer habitat in the southern two-thirds of the Rafferty project area, it is doubtful that the densities there (17.1/mi^2) would be found throughout all of the uplands westward to Dead Lake. Rather, the density estimates for the Midale Pasture survey block (6.6/mi^2) may have been more appropriate to apply to the Project Area as a whole even though this survey block included the Souris River Valley as well as uplands and the only significant treed area, that being at Dr. Mainprize Regional Park. The estimate of 14 deer/mi^2 for the upper reaches of the valleys, upstream from the Souris-Roughbark-Jewel Creek junction may have been appropriate for this portion of the Project Area. The density of 38 deer/mi^2 at the junction emphasized the importance of this area to the white-tailed deer in 1977.

In total, 399 deer were observed within the 29 mi^2 of the four survey blocks, an overall average density of 13.75 deer/mi^2. As three of the four blocks contain some of the best habitat in the entire Rafferty Project Area, it is doubtful that all of the surrounding unsurveyed land would harbour similar deer densities during severe winters. If the areas where no surveys were done attained densities equivalent to those within the Midale SDA Pasture, a total of 243 additional deer would have been projected rather than 593. In other words, the total projected white-tailed deer population in the Rafferty Project Area would have been 812 rather than 1,162.

A similar SPRC Survey of Long Creek on the same date in 1977, from the southern border of the Lomond #3 PFRA pasture to the U.S. border, provided an observed count of 477 white-tailed deer. This number was greater than the 399 deer observed within the four survey blocks along the Souris River. The Long Creek deer were concentrated in three areas: 250 within the first 12.8 km upstream from the U.S. Border, 120 within 6.4 km southeast of Maxim and 50 along 6.4 km of the Creek in the Oungre-Bromhead Area (SPRC Survey maps). These numbers would suggest that Long Creek is also extremely important regional habitat for wintering deer.

Saskatchewan Parks, Recreation and Culture advised the Authority in May, 1987 that the best available data for a severe winter with deep snow was obtained from repeated aerial reconnaissance surveys along the Souris River Valley during deer feeding operations in January, February and March, 1982. During that winter virtually all deer within the Souris River valley were being fed. Approximately 300 deer were concentrated at Dr. Mainprize Regional Park and approximately 300 were concentrated in the McDonald Lake area upstream of Estevan. Despite repeated aerial surveys, very few deer were reported in the Roughbark Creek-Souris River valley confluence area. Due to excessive snow depths, no deer were observed on the adjacent uplands. The total number of observed white-tailed deer in the Rafferty Project Area in the 1981-82 winter, was, therefore 600 (SPRC pers. comm.).

The 1985 data are anomalous: the lack of snow in southern Saskatchewan during the past two winters allowed deer to remain dispersed on the prairie in what is essentially summer range. In previous survey years, aerial surveys found the deer concentrated in protective cover as a result of more typical winter conditions. Severe winters are the main factor limiting deer numbers in Southern Saskatchewan; hunting is also an important limiting factor.

In 1985, within Wildlife Management Zone 15, which includes the Rafferty Project Area, the regular White-tail Deer hunter success was 72.5 percent, the highest of all 16 Farmland Zones in southern Saskatchewan. The average hunter success was 44 percent for all 16 zones. In total, 650 white-tailed deer were harvested in Zone 15, 12.1 percent of the Farmland Zone total of 5,374 deer. The average number of hunter days per animal was only 3, compared to the Farmland Zone average of 7 days. Not only was the success ratio the highest, but the time spent per animal was the least (Saskatchewan Parks and Renewable Resources, Wildlife Management Report, 1985-86).

Based upon the population data available for the last decade, it is reasonable to speculate that the Rafferty Project Area typically supports 400-500 white-tailed deer during normal winter months and up to 600 during severe winters, such as was experienced in 1982; these values can, of course, vary depending upon the production and harvest rates for the preceding years. The Souris Valley certainly must be considered to be primary regional winter range although this has not been evident the past few mild winters.

It is apparent from analysis of all previous surveys, that the Authority requires an up-to-date and accurate detailed study of white-tailed deer in the Rafferty Project Area. To that end, the Authority will undertake white-tailed deer ecological research in the upper Souris River Valley and in the Moose Mountain Creek watershed in 1988, 1989 and 1990. The objectives of this research will include a determination of the current population associated with the valley, a determination of specific seasonal movements to, from and within the valley, and the documentation of use of the different components of the valley complex. Three years will be required for the complete study including at least two full field seasons. The research will include stratified random quadrat aerial surveys in December and February each winter. Radio telemetry will be used to follow animal movements and use of various habitats. The estimated cost for this research is $269,000 (SPRC 1987).

PREDICTION OF IMPACT

1 INTRODUCTION

One of the more significant concerns and criticisms associated with the proposed Rafferty project has been the potential long-term impact upon wildlife habitat and populations in southeastern Saskatchewan. Construction of the Rafferty Dam, Reservoir and appurtenances will have a permanent impact on wildlife habitats and populations within and along the Souris River Valley, both within the direct impact area, upstream and downstream on the Souris and its immediate tributaries, and indirectly on adjacent uplands. The following section addresses a number of specific wildlife issues associated with the Rafferty Reservoir. It is provided to give the reader a more thorough background and appreciation of both the positive and negative impacts of the project. It concentrates upon three of the game species which have been identified as potentially subject to some greater

PHOTO TWELVE: Sharp-tailed Grouse 'dancing' grounds (lek) during spring mating season.
(Photo courtesy Environmental Management Associates)

PHOTO THIRTEEN: Sharp-tailed Grouse during mating season.
(Photo courtesy Environmental Management Associates)

PHOTO FOURTEEN: Ring-necked Pheasant in flight.
(Photo courtesy Environmental Management Associates)

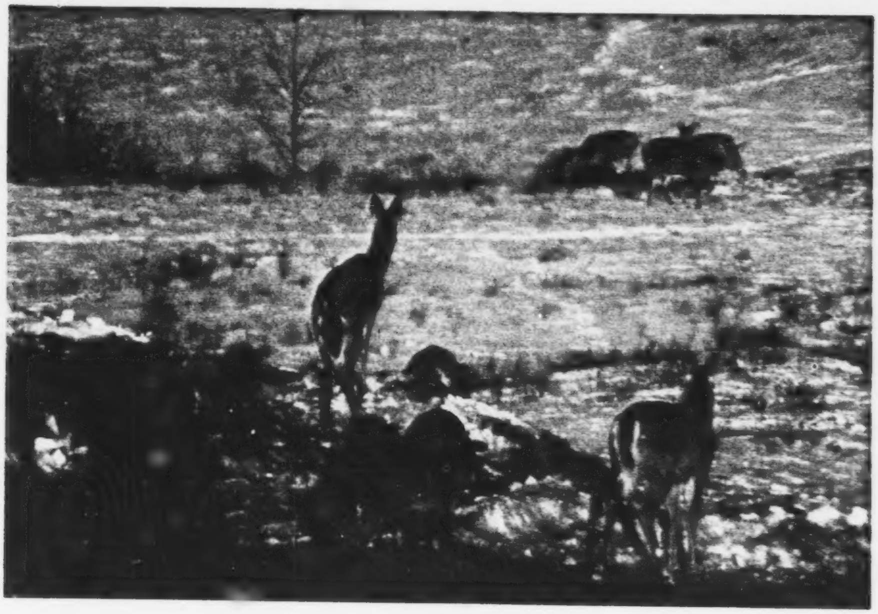


PHOTO FIFTEEN: White-tailed deer feeding.
(Photo courtesy Environmental Management Associates)

negative impact, namely white-tailed deer, Sharp-tailed Grouse and Ring-necked Pheasant. It enlarges upon the relationship of the Rafferty Project to critical wildlife habitat. The impact of the project upon the 15 quarter-sections designated under the "Critical Wildlife Habitat Protection Act, 1985" is also discussed in detail.

Discussion of impact focuses on the operation of the reservoir (i.e., inundation of habitat) although pre-construction and construction-related impact is also addressed.

Discussion pertaining to the impact of the Alameda Reservoir is not included in this document. The Authority has solicited detailed baseline data collection studies in 1987 and will use this to complement existing information to be filed with Saskatchewan Environment early in 1988.

2 PRE-CONSTRUCTION AND CONSTRUCTION ACTIVITIES

i) Habitat Alteration

Wildlife habitat will be altered during certain construction activities. These include tree clearing, excavation of borrow pits, temporary flooding during stream diversion, soil scraping and/or crushing of vegetation by vehicular traffic (Rochester et al. 1984). Some of this habitat will return to its original condition after construction while some may be permanently lost. Floodplain habitats would be most directly affected by dam construction and reservoir creation. While the actual surface area affected may be relatively small, the ecological implications may be substantial as the Souris River Valley, relative to upland areas which are often devoid of trees, provides the best diversity of wildlife habitat. Detailed assessment of habitat loss is presented in Section 3 of this document.

ii) Disturbance

Pre-construction and construction activities involving the presence of humans, machinery and man-made structures represent a potential for disturbing wildlife either through displacement from traditional habitat or physiologically (e.g., injuries incurred during escape or decreased energy reserves as a result of escape). Effects of this nature typically act on individuals rather than populations. Displacement of wildlife results not only in a loss of species from the Project Area but greater competition for food and cover resources in adjacent areas. Construction-related disturbances tend to result in temporary rather than permanent displacement of wildlife, assuming adequate habitat is available to accommodate the displaced animals once they return.

A resident work force and visitors with consumptive (i.e., hunting) and non-consumptive (i.e., camping and bird watching) interests can result in increased harvests of wildlife, loss of habitat through accidental fires or additional disturbance of wildlife.

3 OPERATION AND MAINTENANCE

i) Introduction

Reservoir operation and maintenance, which, for the purposes of this discussion includes clearing and inundation of areas formerly occupied by habitat and associated wildlife, is the major impact of any reservoir. The significance of this habitat loss as described by Ortolano (1973) is a function of: the types and diversity of habitat present; the species and numbers of wildlife inhabiting the flooded area, particularly if "at risk" species are involved; the importance of the lost habitat to the region; and the status of wildlife in neighboring areas.

Reservoir creation tends to result in displacement of resident wildlife or attraction of new species rather than immediate or direct mortality of wildlife. Displaced wildlife may or may not be successfully accommodated in adjacent habitat depending upon the extent to which that habitat is capable of supporting additional animals. In the case of the Souris River Valley, white-tailed deer and upland game bird habitat loss constitute the major concerns. The reservoir may, however, have some positive impacts. For example, the area currently has a paucity of standing water and a large new reservoir will no doubt be utilized by staging waterfowl and shorebirds. Natural islands may be exploited by colonial-nesting birds as well.

Flow regulation associated with reservoir operation can result in habitat alteration downstream of the dam. The greatest concern is for impacts upon riparian habitats, which may be altered as a result of insufficient or excessive flows for sustaining vegetation communities with maximum utility to wildlife resources.

ii) Method of Calculating Critical Wildlife Habitat

Original predictions of the impact of the Rafferty project on wildlife were based on maps produced by the Terrestrial Wildlife Habitat Inventory (Stelfox 1979) and assumed that most of the Souris River Valley and major tributaries would be flooded. Because the habitat was mapped at a 1:250,000 scale, the inventory was geared toward a regional overview and had limitations as far as detail on local areas. Habitat less than 0.8 km wide or less than one-quarter section in area was not mapped unless it was tied in with a larger area.

Maps at a scale of 1:5,000 with one metre contour intervals were provided by the Souris Basin Development Authority to Saskatchewan Parks, Recreation and Culture. These maps allowed refinement of mapping critical wildlife habitat in relation to the Full Supply Level and the assumed reservoir clearing line of the proposed reservoir. At the time of the habitat mapping update, it was anticipated that the Rafferty reservoir would have a Full Supply Level of 551.5 m and a reservoir clearing line one-half meter above that, i.e. 552.0 m. Critical wildlife habitat was identified on 1:20,000 scale photomaps and then transferred to the 1:5,000 scale contour maps. The area of critical habitat for each wildlife species above and below the 552 m elevation was calculated using a digital planimeter.

Open water bodies such as Dead Lake, McDonald Lake and several smaller basins in the Dead Lake channel were excluded from the critical wildlife habitat area calculations even though they are surrounded by critical habitat and were included in the critical habitat on the original 1:250,000 scale maps. The actual river and creek channels have been included as critical habitat for white-tailed deer, Ring-necked Pheasant and Sharp-tailed Grouse, the reason being that water is an integral part of the habitat complex in the river valley. The animals use the water and if the channel and water is removed from the rest of the habitat the whole nature of the habitat would be changed. Therefore it was deemed an essential component of the critical habitat. Similarly, small cultivated and alfalfa fields were included in calculations of critical habitat. These small fields, adding diversity to the river valley are an important component of the habitat.

In addition to critical habitat for white-tailed deer, Ring-necked Pheasant and Sharp-tailed Grouse, the Terrestrial Wildlife Habitat Inventory also identified critical habitat for beaver and western painted turtles. Habitat for both of these species was grouped with larger areas of critical habitat for other species. Both beaver and turtles use only the river or wetlands and the immediate uplands. No calculations were made for critical habitat for these species since it would overestimate the amount of habitat. A survey of dams, lodges and food caches would be required to map habitat for beaver. Although we know that western painted turtles use this reach of the river system and that certain portions are more important than others, no attempt was made to further identify critical habitat for this species beyond that mapped by Stelfox (1979) (Figure 1).

iii) Total Area of Critical Wildlife Habitat

The attached tables identify the amount of critical wildlife habitat which will be affected by the Rafferty Project. Table 11 is a summary of detailed calculations which were prepared for each one-quarter section within the Project Area. Table 12 lists the area of critical habitat which will be below 552 m. It also lists the amount of habitat which will remain above the 552 m elevation. These totals reflect only those sections for which detailed contour maps were available and which will be affected by the reservoir. There are additional areas which are critical habitat, particularly for Sharp-tailed Grouse, on lands upon which the project has no impact.

1,676 hectares (4,141 acres) of critical white-tailed deer habitat will be affected below the 552 m elevation. An additional 2,014 ha (4,977 acres) will remain above 552 m. It is estimated, however, that the impact upon the deer population will be greater than the 45 percent reduction suggested by the actual area of habitat loss. The reason for this is the nature of the habitat associated with the river valley. In many areas there will be habitat remaining above the 552 m elevation but it will be a narrow strip running along the upper edge of the valley. The value of this strip per unit area is less valuable to deer because the core of the habitat on the valley floor will have been eliminated.

1,195 ha (2,953 acres) of critical Ring-necked Pheasant habitat will be affected below the 552 m elevation. Saskatchewan Parks, Recreation and Culture Wildlife Biologists estimated that 1,433 ha (3,541 acres) or approximately 54.5 percent of the pheasant habitat would remain above the 552 m contour.

Virtually all of the Rafferty Reservoir area (excluding existing water bodies such as McDonald, Dead and Elswick Lakes) has been mapped as critical habitat for Sharp-tailed Grouse; 5,015 ha (12,393 acres) have been estimated below

TABLE 11

Area of Critical Wildlife Habitat below Reservoir Clearing Line of the Rafferty Reservoir Upstream from Dam Site "C"

AREA OF CRITICAL HABITAT HECTARES (ACRES)

White-Tailed Deer	Ring-Necked Pheasant	Sharp-Tailed Grouse
1,676 ha (4,141 ac)	1,195 ha (2,953 ac)	5,015 ha (12,393 ac)

TABLE 12

Area of Critical Wildlife Habitat above and below Reservoir Clearing Line of 552 m on the Rafferty Reservoir Upstream from Dam Site "C"

WILDLIFE SPECIES*

	WTD, STG, RNP	WTD, STG	RNP, STG	STG
Hectares =	1,190** (1,197)***	486 (817)	5 (236)	3,335 (18,166)
Acres=	2,941** (2,958)***	1,200 (2,019)	12 (583)	8,240 (44,889)

* WTD = White-tailed Deer
STG = Sharp-tailed Grouse
RNP - Ring-necked Pheasant
** Area of habitat below RCL of 552 m
*** Area of habitat above RCL of 552 m

Since some habitat is critical for more than one species it is necessary to add the totals of the appropriate columns to determine the amount of habitat for each species.

the 552 m elevation. While this is a large area, equivalent to 19.36 sections of land, it is not large relative to all of the critical Sharp-tailed Grouse habitat along the Souris drainage system between Estevan and Weyburn. 20,416 ha (50,450 acres) of critical Sharp-tailed Grouse Habitat was identified by SPRC Wildlife Biologists above the 552 m contour adjacent to the Rafferty Reservoir area. The area affected by the reservoir therefore represents 19.7 percent of the area mapped critical for Sharp-tailed Grouse.

With the relocation of the Rafferty dam downstream and the corresponding lowering of the Full Supply Level and the reservoir clearing line, additional habitat for all three species will be saved in the upper reaches of both the Souris River and Roughbark Creek. This will be especially important to white-tailed deer. It becomes even more significant because the habitat "saved" in this way would be contiguous with other existing habitat. This is also the area where critical habitat for white-tailed deer presently scheduled to be flooded could remain for several years, as this is the area which would be the last to be inundated under Full Supply Level conditions. As a result, this could give the population time to adjust to the changing habitat base and would also allow time to carry out mitigation programs before the habitat is lost.

An area larger than the actual surface area of the reservoir at Full Supply Level has been included within the measurement of lost critical habitat. For example, while the reservoir will have a surface area of 4,545 ha at an elevation of 549.5 m, an area of 5,015 ha, (10.3 percent larger) has been calculated as lost habitat for Sharp-tailed Grouse. This additional lost habitat has been considered to fairly represent additional future habitat losses around the shoreline due to long-term erosion and bank sloughing.

Of this larger area of impact (5,015 ha) calculated at the 552 m elevation, one hundred percent of it has been evaluated as critical for Sharp-tailed Grouse, approximately one-third of it is critical for white-tailed deer and less than one-quarter of it critical for Ring-necked Pheasants (Figure 1).

It should be noted that 1,190 ha (2,941 acres) was considered critical for all three species, 486 ha (1,200 acres) critical for both white-tailed deer and Sharp-tailed Grouse, 5 ha (12 acres) critical for both Ring-necked Pheasants and Sharp-tailed Grouse, and the remainder, 3,335 ha (8,241 acres) critical only for Sharp-tailed Grouse.

iv) Designated Critical Wildlife Habitat Losses

Saskatchewan Parks, Recreation and Culture has identified numerous quarter-sections of provincial crown land in and adjacent to the Souris Valley which are deemed suitable for designation under the Critical Wildlife Habitat Protection Act (CWHP), s.s. 1983-84. Of these, only 15 quarter-sections in the Rafferty Project Area have as of this date been given protection under the Act. Figure 8 indicates those provincial crown lands currently designated or considered suitable for such protection. It is to be noted that federal lands (PFRA pastures) and private lands may not be protected under the C.W.H.P. Act.

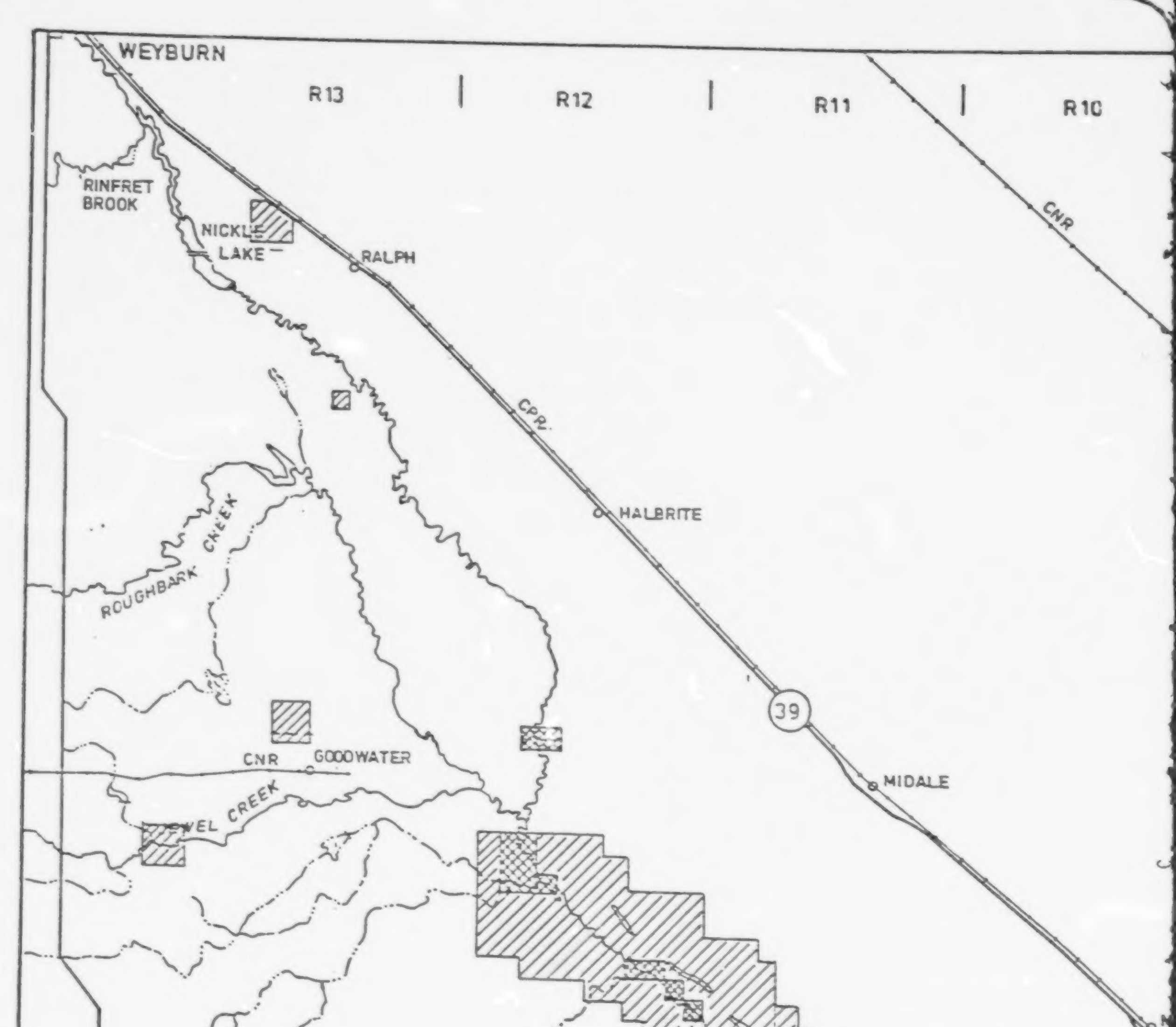
The Authority undertook an evaluation of the direct impact of the Rafferty Project on those 15 quarter-sections currently protected under the Act. The overall importance of these lands to wildlife relates directly to their complex ecosystems within or adjacent to the Valley. These quarter-sections contain a variety of habitats including streamside vegetation in the form of trees and tall shrubs, graminoids/forbs and short shrubs, native grass/shrubs on the flood plains, marshes with cattails dominating, oxbow wetlands and various valley slopes with native grasses and shrubs such as wolf willow and snowberry.

Within these quarter-sections and up to an elevation of 552 m, 422.3 ha (1,044 acres) will be affected, (see Table 13). This represents 43.5 percent of the total 971.3 ha (2,400 acres) of the 15 quarter-sections.

Within these 15 designated quarter sections, there are a number of hectares not strictly native habitat. These include the Dr. Mainprize Regional Park golf course, ball diamonds, picnic and campgrounds (18.6 hectares or 46 acres), gravel pits on four quarter sections (7.9 hectares or 19.57 acres), open water of the river 43.8 hectares or 108.29 acres) and haylands on 9 of the 15 quarters (102.5 hectares or 253.52 acres).

The most severe impact will be the loss of 21.2 hectares of streamside vegetation in the form of trees and tall shrubs (52.39 acres), 14.2 hectares of graminoids/forbs and short shrubs (35.09 acres) and 52.5 hectares of native grass/shrubs on the flood plains (129.84 acres). Approximately 13.9 hectares (34.47 acres) are marsh with cattails dominating, while another 5.26 hectares (13 acres) are in temporary oxbow wetlands dominated by grasses and grass-like plants.

The loss of 112.8 hectares (278.83 acres) of grass/shrub valley slope and another 29.38 hectares (72.60 acres) of valley slope dominated by shrubs


WEYBURN
R13
R12
R11
R10
CNR
RINFRET BROOK
NICKLE LAKE
RALPH
CPR
HALBRITE
ROUGHBARK CREEK
39
MIDALE
CNR
GOODWATER
OWEL CREEK
DEAD LAKE
SOURIS RIVER
35
TRIBUNE
CPR
BROMHEAD
CPR
TORQUAY
OUTRAM
LONG CREEK
350

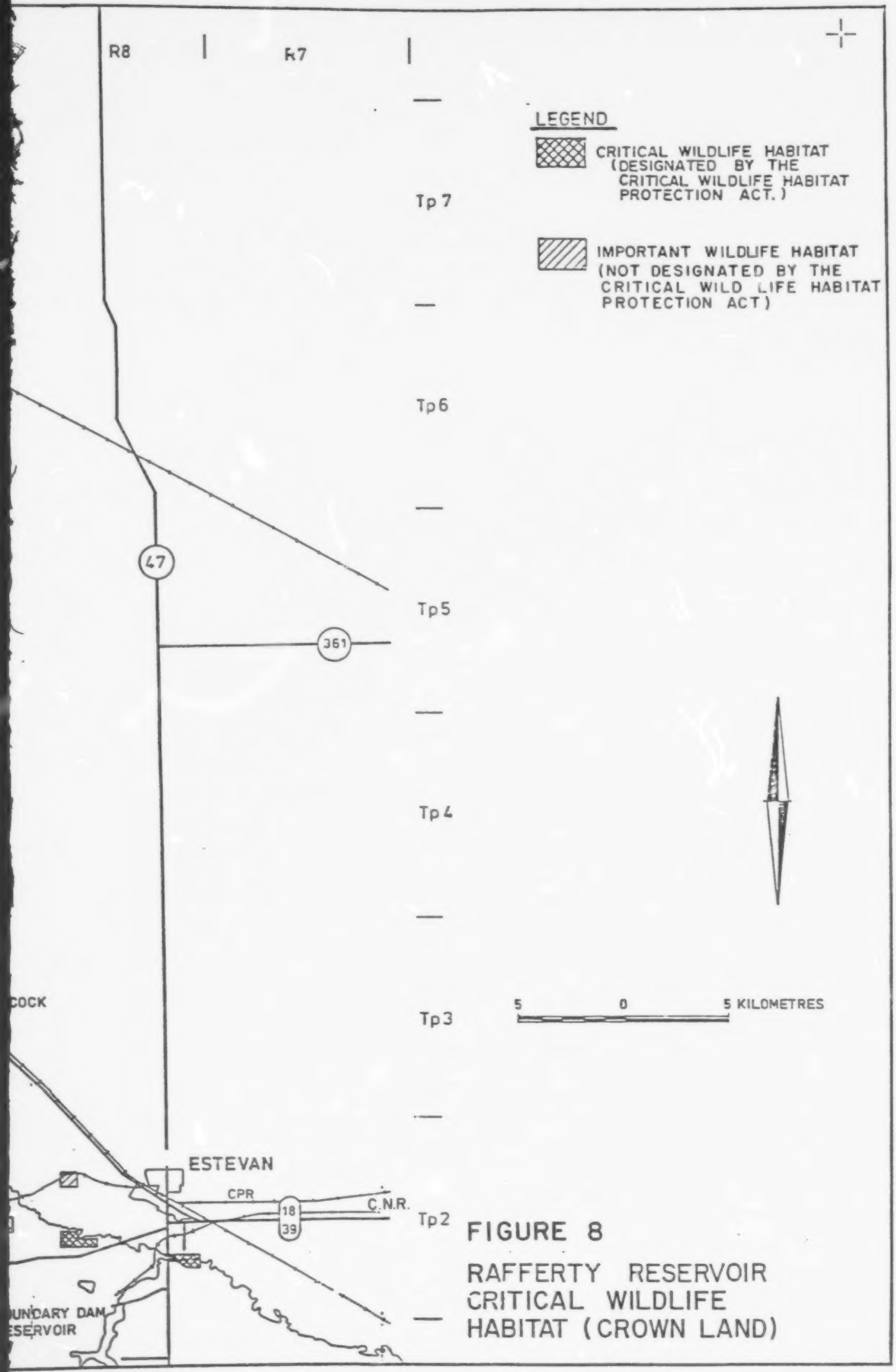

R8
R7
LEGEND
CRITICAL WILDLIFE HABITAT (DESIGNATED BY THE CRITICAL WILDLIFE HABITAT PROTECTION ACT.)
IMPORTANT WILDLIFE HABITAT (NOT DESIGNATED BY THE CRITICAL WILD LIFE HABITAT PROTECTION ACT)
Tp 7
Tp 6
47
Tp 5
361
Tp 4
COCK
Tp 3
5
0
5 KILOMETRES
ESTEVAN
CPR
C.N.R.
18
39
Tp 2
UNDARY DAM
ESERVOIR

FIGURE 8

RAFFERTY RESERVOIR CRITICAL WILDLIFE HABITAT (CROWN LAND)

TABLE 13

SUMMARY OF IMPACT OF RAFFERTY RESERVOIR
On Designated Critical Wildlife Habitat
Lands Up to 552 Metres by Cover Type

COVERTYPE	#1	#2	#3	#5	#6	#7	#10	#11	#12	#13	#14	TOTAL HA.
Land Descr.												
NW 24-4-12	.85			19.56	12.41		4.81	7.61	1.28			46.50
SE 26-4-12	5.21			15.36	14.21		4.74	4.90	.65			45.06
NW 26-4-12	7.26		11.36	.04	10.72		2.47	4.72				36.56
NE 27-4-12	.90		.11			9.92		6.11			18.62	35.65
NW 5-5-12		.38	2.81	6.98	7.06	4.00		2.23				23.45
NE 5-5-12		1.05	24.41		10.95	1.87		4.49	.77			43.53
NE 6-5-12				2.90								2.90
NE 7-5-12		.85	.94		18.34			1.14	1.68	2.61		25.55
SE 7-5-12					6.48	2.36	.33		.25	1.19		10.60
NW 8-5-12		3.99	32.61	1.13	7.13	.56		5.27	.65	2.41		53.74
SW 8-5-12		4.92	13.32	3.22	16.33	6.95	1.61	4.88		1.71		52.93
SW 29-5-12		6.99	8.45	3.32	.20	3.74		2.49				25.18
SE 29-5-12		3.04	8.61	.05	4.47							16.16
NW 28-2-9												0.00
NE 28-2-9					4.57							4.565
Hectares:	14.20	21.20	102.6	52.55	112.84	29.38	13.95	43.83	5.26	7.92	18.615	422.34
Acres:	35.09	52.39	253.52	129.84	278.83	72.60	34.47	108.29	13.00	19.57	46.00	1043.59
Percent:	(3.36)	(5.02)	(24.29)	(12.44)	(26.72)	(6.96)	(3.30)	(10.38)	(1.25)	(1.88)	(4.41)	(100.0)

#1 - Streamside-graminoids/forbs short shrubs
#2 - Streamside maples and tall shrubs
#3 - Alluvial Floodplain haylands
#5 - Alluvial Floodplain native grass/shrubs
#6 - Valley slope grass/shrub
#7 - Valley slope-shrubs (Snowberry wolf willow)/grass
#10 - Marsh (cattails dominant)
#11 - Open Water River/Lake/Slough
#13 - Gravel Pits
#12 - Oxbow wetlands temp. wetland dominated by grasses & grass-like plants
#14 - Dr. Mainprize Golf Course, Ball Diamond, Picnic area

(snowberry, wolf willow) should not be as significant considering the amount of similar vegetation and topography in the immediate vicinity. This cover is used mainly by Sharp-tailed Grouse but is of value to Ring-necked pheasants and white-tailed deer as well.

While acknowledging the composition of those lands which will be inundated, it is important to stress that the value of these lands to wildlife lies in their complexity in terms of vegetation and topographic relief. The haylands, valley slopes, trees, shrubs, river and marshes combine to create the complex that is so valuable.

v) Impact of Actual Wildlife Habitat Losses

Although it is a relatively simple task to identify and undertake area calculations of lost wildlife habitat, it is much more difficult to ascertain the real significance of such habitat within the ecology of various species. It is an oversimplification to assume that all such critical habitat is of equal quality. River valley complexes such as the Souris system take on significantly greater importance when they are located in an otherwise relatively featureless and treeless upland plain. While it is fully understandable that wildlife will first and most often occupy those areas which best provide their life support systems such as for food and shelter, and rearing of young, it is much less understood exactly how the various habitats relate to one another and to the life cycles of the various wildlife species. One would expect all wild animals to select the most superior habitat for their use. Some species such as white-tailed deer appear to be much more tolerant and adaptable to changing or different habitat environments than other species. Again, some species occupy a small area for their life-history requirements (home range) while others have extensive home ranges, often varying with seasons.

All wildlife species which currently utilize the Souris River Valley in the Rafferty Project Area will be affected; some more than others. The key to determining the significance of those impacts is the determination of precisely how dependent those species are upon the river valley which will be inundated. Those species which cannot adapt to alternative locations or different environments obviously will suffer most. Wildlife species which can better adapt to inferior or alternative habitats would not be as severely affected. Individuals or populations of wildlife which are physically displaced due to the loss of their preferred environments would be forced into adjacent habitats possibly to be shared with others. Without mitigation, such displacements normally have negative impacts upon all wildlife involved. Even if it may be possible for adjacent habitats to be shared by existing and displaced populations, the long-term net impact would be a reduction of wildlife populations.

Although it is assumed that the Rafferty Project could have major implications for wildlife, it has been and is extremely difficult to quantify those implications. It has been known for some time that the Souris River Valley and adjacent uplands form one of the major wildlife production areas in southeastern Saskatchewan; high densities of Sharp-tailed Grouse and white-tailed deer occur there. The latter rely heavily on the valley and its tributaries for protection during severe winters. The lack of detailed knowledge of the ecology and current population levels of these species has made it impossible to precisely quantify the significance of the projected acreages of lost habitat. For example, it has not been determined by provincial wildlife biologists or the Authority what the importance of the valley bottom is relative to the valley slopes or adjacent uplands. This knowledge is lacking for both white-tailed deer and Sharp-tailed Grouse, the two game species expected to be most significantly affected. The Authority will undertake specific new research over the next three years to obtain a better understanding of the ecology of these two wildlife species. This research will yield improved baseline data on current populations and habitat utilization which may be impacted by Rafferty and provide the necessary details for future mitigation efforts.

Despite this current lack of detailed knowledge, Saskatchewan Parks, Recreation and Culture estimated the potential impact of the combined Rafferty and Alameda Projects on wildlife, assuming no mitigation (Table 14). It is to be noted that the estimated loss of 1,500 white-tailed deer was based upon 1,200 at Rafferty and 300 at Alameda. With the lower reservoir elevation at Rafferty and the revised estimate of white-tailed deer (600), the total of 1,500 is excessive.

TABLE 14

Identifiable Potential Impact of Combined Rafferty and Alameda Projects on Wildlife (No Mitigation)

Change In	White-tailed Deer	Mule Deer	Sharp-tailed Grouse	Ring-necked Pheasants	Ducks	Geese
Breeding Population	-1,500	100	-2,400	-260		
Fall Staging Waterfowl Population					+30,000	+35,000
Annual Harvest	-330		-1,720	-165	+1,500	+1,500
Degree	Major	Minor	Major	Major	Major	Major
Duration	Long Term	Long Term	Long Term	Long Term	Long Term	Long Term
Geographic Extent	Regional	Local	Regional	Local	Regional	Regional

Source: Saskatchewan Parks, Recreation and Culture, 1985.

In addition to the potential impacts suggested in Table 14, there will be loss of habitat for a number of other non-game species including coyotes, aquatic furbearers, small mammals and several grassland bird species. Impact on species such as western painted turtles and potential changes in wildlife travel and migration routes within the Souris River system are also likely to be negative. As discussed above, portions of 15 quarter-sections of crown land designated as critical habitat under the Critical Wildlife Habitat Protection Act will also be lost.

As with the National Wildlife Refuges on the Souris River System in North Dakota (Upper Souris and Des Lacs), the reservoir is expected to provide a staging area for waterfowl, especially geese, and shorebirds, thus improving waterfowl hunting, providing spectacular viewing opportunities and adding to tourism development opportunities. The change from a riverine to a lacustrine environment will also change the species composition of the wildlife, especially birds, likely providing a greater diversity of shoreline and aquatic species. This could create, in time a significant destination site for bird-watchers, photographers and naturalists.

MITIGATION AND ENHANCEMENT

1 DAM SITE RELOCATION

As described in the Project Description, the Environmental Impact Assessment process has been integrated with project planning. As originally conceived, the Rafferty Dam was proposed approximately four kilometres further west with a Full Supply Level of 551.5 m and a Maximum Flood Level of 555 m. There would have been considerably greater impacts on wildlife habitats and populations at that location and elevation than those now associated with the current proposal. Immediate impacts are further reduced as the Initial Operating Level of 549.5 m is a full two meters lower.

Relocation of the Rafferty Dam further downstream and lowering of the reservoir's Full Supply Level, will save considerable amounts of wildlife habitat. On the floodplains of the Souris River and the Roughbark Creek alone, not considering the reduced impact up coulees and smaller tributaries along the entire length of the reservoir, 212.5 ha of habitat will be saved. This area was deemed critical for all three species, white-tailed deer, Ring-necked Pheasants and Sharp-tailed Grouse. Also, an additional 8.5 ha of critical habitat for Ring-necked Pheasants and Sharp-tailed Grouse will not be inundated at the Full Supply Level of 550.5 m.

Associated with the lowering of the reservoir Full Supply Level, it is proposed that clearing of natural vegetation be restricted to lands below that elevation rather than the 552 m elevation for which area calculations were made. This will save considerable vegetation in the upper reaches which is important habitat for white-tailed deer, Ring-necked Pheasants, Sharp-tailed Grouse, beaver, muskrats and western painted turtles.

Area calculations of lost habitat for beaver, muskrat, western painted turtles or other species have not been undertaken.

Surcharging of the reservoir during floods will be permitted to inundate existing vegetation above Full Supply Level. While the reservoir will occasionally flood to 551 or 552 meter elevations during spring floods, these events are expected to be uncommon and of relatively short duration resulting in no net loss of habitat.

The habitat saved by the lowering of the Full Supply Level and reduced clearing, is contiguous to other important habitat in the Roughbark Creek and Souris River area. With reservoir filling expected to take a number of years, loss of habitat will be neither sudden nor immediate. This will allow wildlife populations some time to adjust to the changing habitat base. It will also allow time to implement habitat enhancement and replacement elsewhere.

With the original dam site, it was estimated that 6,220 ha (15,370 acres) of critical wildlife habitat would be lost at the maximum flood elevation of 555 m. This has now been reduced by 27 percent, hence about 4,550 ha (11,245 acres) will now be affected at the lower reservoir clearing line of 549.5 m.

2 RECOMMENDATIONS

i) Introduction

All of the lands to be affected by the Rafferty Reservoir are considered to be critical wildlife habitat for Sharp-tailed Grouse. Up to the 552.0 m elevation, a total of 5,015 ha (12,392 acres) are expected to be either inundated or subjected to sloughing and erosion (the reservoir at Full Supply Level is considerably smaller.) 1,676 ha (4,141 acres) of critical white-tailed deer habitat and 1,195 ha (2,953 acres) of critical Ring-necked Pheasant habitat are included in the total reservoir area.

Acknowledging that the Rafferty Project will have substantial impact upon critical wildlife habitats, the Souris Basin Development Authority has assembled a comprehensive mitigation enhancement and monitoring plan which it believes will largely ameliorate negative impact. The Authority is strongly committed to developing this plan in concert with Provincial Government officials and representatives of groups such as the Saskatchewan Wildlife Federation, the Saskatchewan Natural History Society and affected Rural Municipalities.

3 MITIGATION AND ENHANCEMENT

i) Pre-construction and Construction Activities

Pre-construction and construction activities will be scheduled, where possible, to minimize disturbance of wildlife in locations known for their importance in supporting life-history activities such as Sharp-tailed Grouse reproduction or white-tailed deer wintering.

Improved access to the Souris River Valley associated with construction roads may afford increased hunting opportunities for construction personnel and the general public. The Authority will direct the Contractor that on-site hunting by construction personnel will not be permitted. Public use of Project roads will be restricted by gates.

Clearing of larger trees will be accomplished by removing economically retrievable material and clearing and burning the remaining large scrub growth, limbs and tree tops. Reservoir clearing activities will ensure that all heavy machinery activities are restricted to elevations below 549.5 m, to reduce negative impacts above that area.

Burning of scrub growth and slash will be restricted to supervised burning at suitable times to ensure that fires do not spread to adjacent grasslands, community pastures or native vegetation above the clearing line. The burning will be coordinated to minimize the number of fires burning at any one time. Reservoir clearing and disposal of wastes will proceed from the eastern end of the reservoir upstream, coordinated with the dam construction and in advance of any potential reservoir filling. Clearing and disposal will be completed no later than March 1990 east of Primary Grid #606 and up to the 544.5 m elevation near the junction with Roughbark Creek by 1991, excluding Dr. Mainprize Park. Dr. Mainprize Park would be cleared last, just prior to inundation. Clearing above the Roughbark-Souris confluence will also be delayed as long as possible, and will be determined according to previous years filling. All clearing should be completed prior to the 1993 spring runoff.

Staged clearing will ensure that negative impact on wildlife habitat will be spread out over a number of years commencing at the eastern end so that the best white-tailed deer habitat will be retained as long as possible and so that deer populations will have an extended period of adjustment to the changing environment.

In the unlikely event of a predicted major flood (such as the 1 in 100 year flood) immediately after completion of the dam, which would inundate the trees and larger shrubs, reservoir clearing would be accelerated and all necessary clearing and disposal up to the 549.5 m elevation would be undertaken in late winter prior to spring runoff.

All costs, estimated to be $250,000 (100 ha @ $2,500/ha), associated with reservoir clearing and disposal are project costs; they have not been included in the wildlife mitigation component below.

ii) Operation and Maintenance

In addition to the benefits of moving the proposed Rafferty dam, a number of other wildlife mitigation measures are proposed by the Authority. These are valued at $2.1 million and include:

.1 Establishing alternative and enhanced habitat areas for white-tailed deer at the following locations:
  a) on the Souris and Roughbark valley floors above the maximum flood control level,
  b) within the Midale Pasture,
  c) in selected block plantations around the reservoir,
  d) within the Dead Lake Channel west of #606,
  e) adjacent to Long Creek southwest of Rafferty Reservoir, and
  f) downstream from Estevan.

.2 Reducing conflict between grazing cattle and nesting and brood habitat by fencing important areas.

.3 Giving priority to wildlife on all suitable islands created within the reservoir and improving habitat on those islands.

.4 Designating alternative lands for protection under the Critical Wildlife Habitat Protection Act (near those affected, if possible, or downstream).

.5 Creating alternative wetlands to replace losses at the Midale Dam marshes, McDonald Lake, along the river and in river oxbows.

.6 Acquiring, designating and managing coal spoil areas in the Estevan-Bienfait-Roche Percee area as wildlife lands.

.7 Establishing ecological reserves and/or natural areas in the Souris-Pinto area or further downstream along the Souris Valley.

.8 Promoting additional wildlife habitat enhancement and protection of superior wildlife habitat lands within the Souris River Valley, downstream, as has been undertaken over the past 50 years along portions of the Souris River in North Dakota.

.9 Constructing artificial nest sites for raptors.

.10 Creating appropriate short-term and long-term reservoir development guidelines or controls to ensure that long-term resource management objectives are met, and

.11 Establishing an appropriate and adequate Trust Fund to handle future ungulate and waterfowl depredation prevention and compensation requirements.

An integrated and cooperative plan of action will be developed in consultation with wildlife officials of Saskatchewan Parks, Recreation and Culture, the Saskatchewan Wildlife Federation, the Saskatchewan Natural History Society, Ducks Unlimited Canada, the affected Rural Municipalities and other wildlife interest groups to ensure optimum long term benefits associated with these mitigation measures. A ten year operations and maintenance budget will be established to support the capital expenditures. Monitoring will be undertaken to ensure optimum benefits from the expenditures.

Without prejudging the input of the foregoing interest groups, each of the proposed mitigation measures is now discussed in detail. Note that the development costs associated with each mitigation option do not include continuing operating and maintenance funds. These are covered later following the discussion of all capital mitigation/enhancement proposals.

.1 Alternative and Enhanced Habitat Areas for White-Tailed Deer

a) One of the suggestions for mitigating the negative impact of the Rafferty project upon white-tailed deer and other wildlife is the establishment of tree plantations and supplemental feeding sites adjacent to or within remnants of original habitat where displaced wildlife will tend to congregate. A variety of tree and shrub species, including conifers will be important to provide alternative browse and shelter.

The areas with the greatest potential for enhancement are within the upper reaches of the Souris River and Roughbark Creek. These areas will not be affected at any time by the reservoir above the maximum flood control elevation. As with other alternatives, wildlife specialists from Saskatchewan Parks, Recreation and Culture will be consulted in the selection and development of these areas. (Potential areas include portions of Sections 15, 16, 21, 23, 26, 28 and 34 in Township 6, Range 13 and Sections 2 and 3 in Township 7, Range 13 West of 2nd M.) Enhancement will include supplemental tree and shrub planting for shelter as well as forage crops and crops such as sunflower or sanfoin for supplemental feed. Development of such selected areas in the upper reaches will help increase the carrying capacity for deer and mitigate the losses of downstream lands below the Full Supply Level. These areas will have to be acquired, cultivated where necessary and planted with appropriate food and shelter species. Fencing of these areas will be required to restrict access by cattle grazing in the adjacent pastures. Fencing will likely also be of a type sufficient to ensure that beavers, rabbits and deer are similarly restricted for periods of time to ensure that the trees are not eaten soon after planting. A monitoring and research program will be required to ensure success.

Another method of enhancement for deer entails the regulation, reduction or periodic elimination of cattle grazing from the treed river bottom areas intended for wintering deer. Feeding with a pelleted ration might be required during severe winters but this is not recommended under normal winter conditions. Furthermore, Provincial wildlife biologists would be consulted prior to implementation of such a feeding program.

Mitigation Costs

On Valley Floors Above Flood Control Level of 554.0 m

1)	Land Acquisition 65 ha @ $620/ha	$ 40,300
2)	Fencing out of community pasture 2.5 km @ $2,000/km	5,000
3)	Tree plantations in various isolated blocks Total 20 ha @ $1,750/ha	35,000
4)	Food/habitat enhancement (sunflowers, alfalfa, sanfoin) 30 ha @ $250/ha	7,500
5)	Deer Feeders (in trust fund)	(nil)
	Total	$ 87,800

b) Portions of the south half of Section 31, and north half of Section 30-4-11-W2 as well as the south half and NE quarter of Section 36-4-12-W2 already contain bluffs of aspen and willow around the perimeters of shallow wetland areas. As some cover already exists, it is a good candidate area for enhancement given that deer now winter 3 km west in the Dr. Mainprize Park area. This land will be removed from the Midale Pasture and some adjacent patented lands purchased. Cultivated portions will be converted to a combination of dense shelterbelts and forage crops for the deer. Feeding with pelleted rations might be required during very severe winters. Designation of the land under the C.W.H.P. Act will also be considered to ensure its long-term availability for white-tailed Deer and other wildlife species.

Mitigation Costs

Within Midale Pasture

1)	Acquisition of 65 ha adjacent private land	$ 40,000
2)	135 ha of Midale Pasture to be fenced out of pasture to exclude cattle 8 km @ $2,000/km	16,000
3)	Habitat enhancement, block tree plantations, shelterbelts 30 ha @ $1,750/ha	52,500
4)	Food enhancement (alfalfa, sunflowers, sanfoin) 10 years @ $3,000/year	30,000
	Total	$138,500

c) The proposed purchase line and reservoir management area boundary includes a number of areas where soil conditions and topography combine to create suitable sites for additional block plantations or enhancement of existing cover and food. Site specific soil investigations will determine the most appropriate species composition and enhancement program. Conifers, willows, poplar and a variety of shrubs can create "islands" of wildlife refuge around the reservoir. It is proposed that such areas will be designated, developed and managed primarily for wildlife. Plant ecologists, soil scientists and wildlife biologists will be consulted prior to implementation of a planting program.

Mitigation Costs

Scattered Block Tree Plantations around Reservoir

1)	Land acquisition (minimal	
	Part of land purchase program	
	estimate 65 ha @ $620/ha	$ 40,300
2)	Fencing 3.5 km	
	Total @ $2,000/km	7,000
3)	Estimate 10 blocks @ 12 ha each	
	120 ha @ $1,750/ha	210,000
	Total	$257,300

d) Portions of the Long Creek drainage areas are critical habitat for Ring-necked Pheasants, Sharp-tailed Grouse and white-tailed deer. Some of the losses of white-tailed deer habitat in the Souris Valley and Roughbark/Jewel Creeks could be mitigated through enhancement of the Long Creek drainage course. This would be especially useful to deer on the uplands south and west of the Souris Valley which may have previously congregated at Dr. Mainprize Regional Park or in the valleys near the Roughbark-Souris confluence during severe winters. Sharp-tailed Grouse and Ring-necked Pheasant habitat would be protected and enhanced. As there is little grazing of cattle in the vicinity of some prospective sites, fencing will not be required for all lands acquired or enhanced with trees, shrubs, forage or other food crops.

Mitigation Costs

1)	Land acquisition	
	300 ha @ $620/ha	$186,000
2)	Fencing (if required)	
	8 km @ $2,000/km	16,000
3)	Habitat enhancement	
	75 ha (food) @ $250/ha	18,750
	75 ha (trees/woody cover)	
	@ $1,500/ha	112,500
4)	Deer feeder	3,750
	Total	$337,000

e) A portion of the Dead Lake Channel between Supergrid #606 and the Souris Valley, 5 km northwest, will be diked off to prevent it from being inundated by the Rafferty Reservoir. This would save some additional existing white-tailed deer, Ring-necked Pheasant and Sharp-tailed Grouse habitat. The shelter created by the valley and enhanced by two or three block tree plantations would make the area even more attractive to deer. Enhancement of the wetlands along the channel will also be undertaken by means of dikes and releases of water from Rafferty at the western end and subsequent removal back into Rafferty at #606. Fresh water marshes and adjacent habitat protection from cattle grazing within the community pasture could mitigate some of the losses of the marshes along the Souris River near Dead Lake. It is proposed to relocate Dr. Mainprize Regional Park into the west end of this channel. The new trees within the relocated park would provide winter shelter for deer as is now the case in the existing park. This entire area was considered critical white-tailed deer wintering habitat by Noble and Flory (1978) as shown in Figure 9.

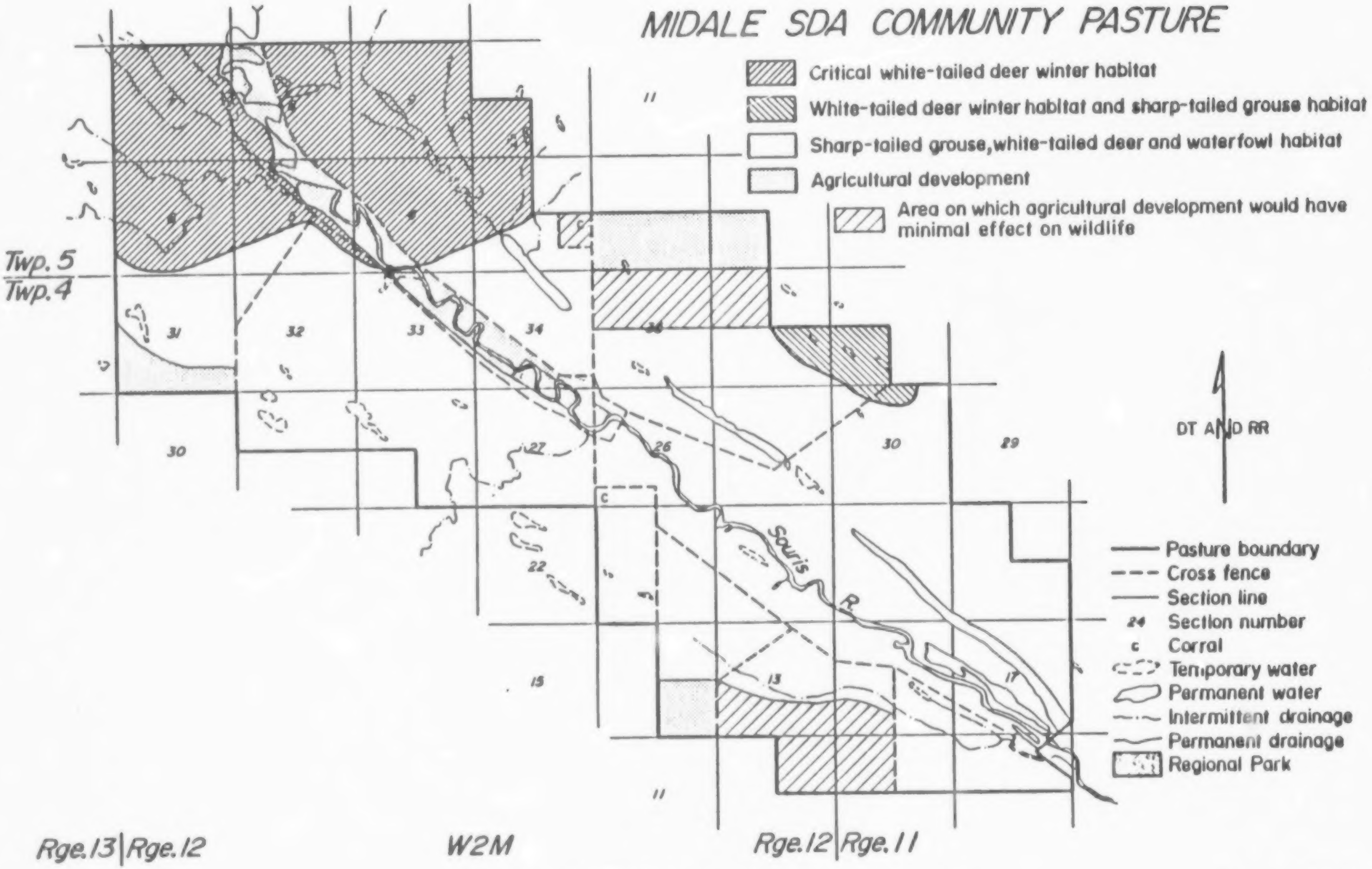
Mitigation Costs

Block and Shelterbelt Plantations in Dead Lake
Channel (West of #606)

1)	Land acquisition - crown land (Part of Midale Pasture)	(nil)
2)	Fencing 3.2 km @ $2,000/km	$ 6,400
3)	2 blocks @ 12.5 ha each 25 ha @ $1,750/ha	43,750
	Total	$ 50,150

f) Stelfox (1979) and others have identified much of the Souris River Valley downstream from Estevan as Critical Wildlife Habitat for a number of wildlife species, including white-tailed deer. In fact, the reach of the Souris Valley southeast of Estevan to the United States border is much more complex, supporting a much richer variety of wildlife than that proposed to be inundated by the Rafferty reservoir.

More than a decade ago, the International Biological Program recommended establishment of a Natural Area in the Souris-Pinto area. The program proposes to identify, acquire and designate appropriate lands for their long term protection and for acceptable uses. It is deemed appropriate for the Souris Basin


MIDALE SDA COMMUNITY PASTURE
Critical white-tailed deer winter habitat
White-tailed deer winter habitat and sharp-tailed grouse habitat
Sharp-tailed grouse,white-tailed deer and waterfowl habitat
Agricultural development
Area on which agricultural development would have minimal effect on wildlife
Twp. 5
Twp. 4
11
31
32
33
34
36
30
27
26
30
29
22
15
13
17
11
Souris R.
C
DT AND RR
Pasture boundary
Cross fence
Section line
24 Section number
c Corral
Temporary water
Permanent water
Intermittent drainage
Permanent drainage
Regional Park
Rge.13|Rge.12
W2M
Rge.12|Rge.11

Important wildlife habitat in Midale SDA Community Pasture.

FIGURE 9

Source: Saskatchewan Tourism & Renewable Resources
- Wildlife Technical Report 78-7, D. Noble, P. Flory
- A proposal for the retention of Wildlife Habitat in Midale SDA Community Pasture

Development Authority to protect such alternative lands within the Basin as one means of mitigating and compensating for some of the negative impacts of the Rafferty Project.

Mitigation Costs

Acquisition/Designation of Areas Downstream from Estevan

1) Land acquisition and designation (various parcels) Total 195 ha @ $1,250/ha	$243,750

.2 Reducing Grazing/Habitat Conflicts:

Grazing of cattle has been identified as a serious and direct conflict with wildlife production and habitat preservation. To improve the productivity and carrying capacity for a variety of wildlife species, the majority of community and private pastures will be fenced to restrict cattle access to the lands surrounding the reservoir shoreline. This approach will help to secure nesting and brood habitat, and maintain food and shelter for deer and other species throughout the year. Dugouts will be provided, where necessary, to ensure alternative water sources for cattle.

Mitigation Costs:

Fencing - 48 km @ $2,000/km	$ 96,000
Dugouts - estimate 10 @ $5,000/each	$50,000
Total	$146,000

.3 Giving Priority to Wildlife on Islands

The Authority plans to acquire and designate a number of islands within the reservoir as "Critical Wildlife Habitat" under the C.W.H.P. Act. These islands can be managed to improve nesting and brood habitat for Sharp-tailed Grouse and waterfowl and are expected to develop into significant breeding and nesting areas for Canada Geese. The shorelines may become important for loafing and staging, primarily by Snow Geese in the fall. Colonial-nesting birds such as Double-crested Cormorants may also exploit these islands for nesting purposes. As new, isolated islands, competition from grazing cattle will be eliminated. Predator controls can be implemented to further improve productivity rates.

With the proposed Rafferty Dam at site C, approximately 3.5 km downstream of the original site, two large islands will be created in the lower reaches of the reservoir in the vicinity of McDonald Lake. These islands will be 3.2 to 3.5 km long and up to 500 meters wide, as show in Figure 10. Each island will be approximately 100 hectares in size.

A third, smaller island in sections 15 and 16, -3-10-W2, will be approximately 1.4 km long and up to 200 meters wide. It is currently considered as critical habitat for Sharp-tailed Grouse. This land would cease to be an island whenever the reservoir dropped below 548 meters unless there were some channelization in the intervening lowlands.

A fourth island will be created in sections 16 and 17-3-10-W2nd by similar excavation to deepen the channel at the western end. This island would be 1.2 km long and up to 300 meters wide. It also is considered to be critical Sharp-tailed Grouse habitat. In addition to the dredging, placement of one or two small dams or weirs to hold water above the Full Supply Level during the critical nesting period would have the added benefit of creating some additional waterfowl nesting habitat within two adjacent shallow ravines in section 17. Similar wetland potential exists in a number of other embayments and shallow ravines. All such opportunities will be investigated in co-operation with Ducks Unlimited Canada and the Saskatchewan Wildlife Federation.

A 3.2 km long island will be created exclusively for wildlife at the extreme southeast end of the "hogsback" between Dead Lake and the main Souris River Valley channel. This island, in sections 17, 18 and 19-4-11-W2M, will be up to 400 meters wide at its northern end. An excavated channel (or perhaps predator fencing) would ensure that the island would not be used by cattle in the Midale Community pasture, to the north-west. The area is currently considered to be critical Sharp-tailed Grouse habitat.

Immediately south of the confluence of Roughbark Creek with the Souris River, two other islands will be created by the reservoir. The southern island, wholly within the SW 1/4 of section 8-5-12, is already designated as "Critical Wildlife Habitat" under the C.W.H.P. Act. This small island (750 meters by 100 meters) is considered critical habitat for Sharp-tailed Grouse. The more northerly island in NE 1/4 section 7 and SE 1/4 section 18 will be 900 meters long and up to 320 meters wide. With the extent of sand and gravel deposits in the channel to

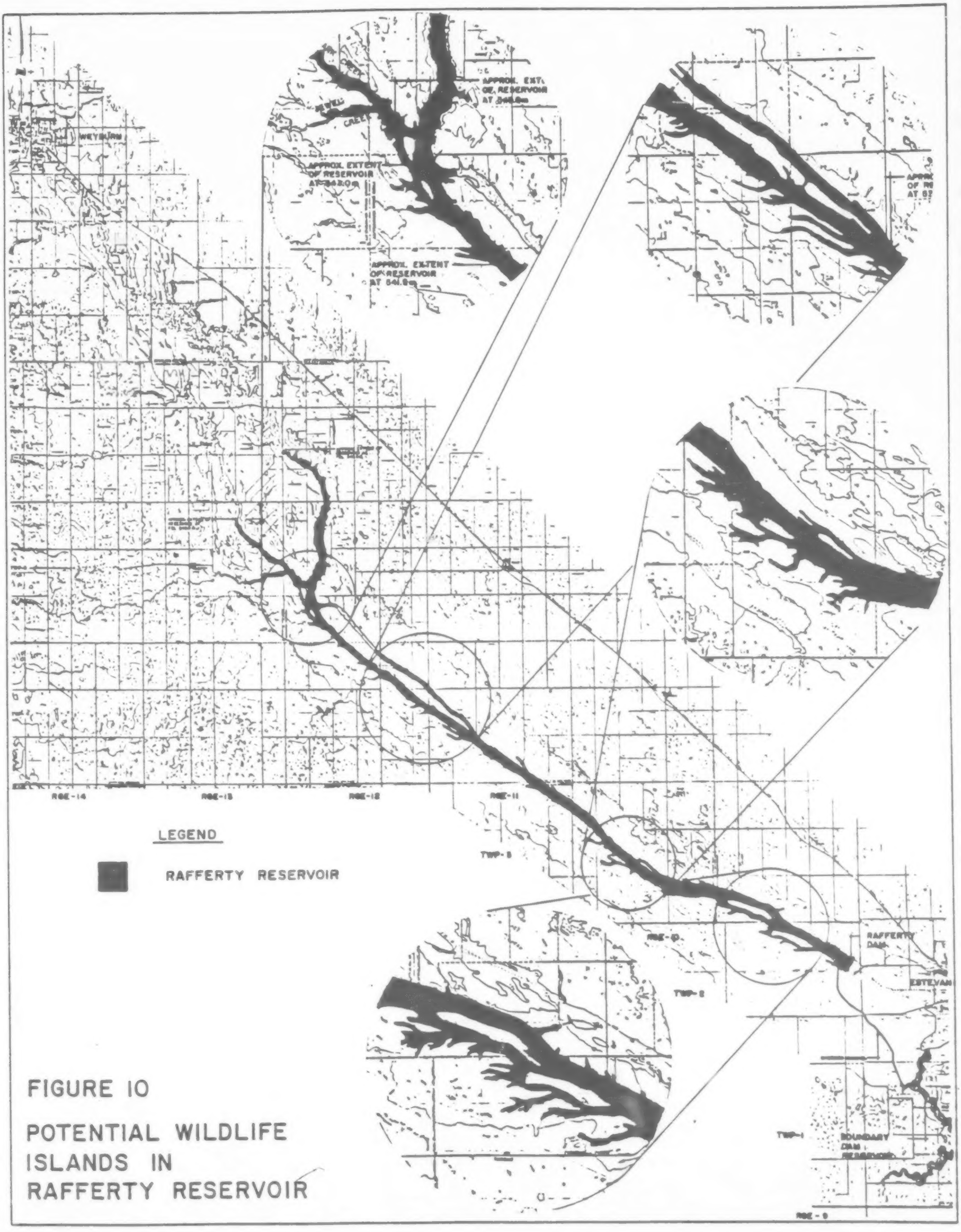

WEYBURN
APPROX. EXT. OF RESERVOIR
JEWEL CREEK
CREEK
APPROX. EXTENT OF RESERVOIR
APPROX. EXTENT OF RESERVOIR AT 541.0m
APPROX. OF RE AT 5
RGE-14
RGE-13
RGE-12
RGE-11
RGE-10
RGE-9
TWP-3
TWP-2
TWP-1
RAFFERTY DAM
ESTEVAN
BOUNDARY DAM RESERVOIR
LEGEND
■ RAFFERTY RESERVOIR

FIGURE 10

POTENTIAL WILDLIFE ISLANDS IN RAFFERTY RESERVOIR the west, a sandy shoreline is anticipated. These islands will remain at all reservoir elevations exceeding 546 meters. These six larger islands could become very productive nesting and rearing habitats. All could be designated under the C.W.H.P. Act. Access to the islands by people will be permitted but activities would be restricted at certain times of the year.

An island habitat management program will also be developed in consultation with the Saskatchewan Wildlife Federation and other wildlife interest groups to enhance wildlife productivity. Suitable vegetation may be planted on the islands to enhance the native vegetation for waterfowl nesting. In addition, a predator control program will be considered to increase nesting success. Such management decisions should have the direct input of wildlife biologists of Saskatchewan Parks, Recreation and Culture and local members of the Saskatchewan Wildlife Federation.

Mitigation Costs:

- Island enhancement and nesting habitat program (400 ha)	$50,000
- Predator fencing/dredging if required	20,000
Total	$ 70,000

.4 Designating Alternative Lands Under the Critical Wildlife Habitat Protection Act

To fully compensate for the loss of lands designated under the Critical Wildlife Habitat Protection (C.W.H.P.) Act in 1985, the Authority will designate suitable alternatives. Up to the 552 m elevation, it has been determined that the Rafferty Reservoir will directly affect 422.3 hectares (1,044 acres) or approximately 43.5 percent of those 15 quarter sections now protected under the Act. Although the majority of the land to be flooded is the most important to wildlife within each of the quarter sections, there are a number of suitable alternatives which can be designated. In addition to the islands, discussed above, there are alternative critical wildlife habitat lands immediately adjacent to or within the Souris River Valley both downstream from Estevan and upstream above the maximum flood control elevation of the reservoir.

The Souris Basin Development Authority will acquire and designate the equivalent of ten quarter sections, or 647.5 ha, 50 percent more than the total amount being lost to the Rafferty Reservoir. Saskatchewan Parks, Recreation and Culture will be requested to assist the Authority in identifying the most suitable lands for designation under the Act. The Authority recognizes that there are extensive areas of suitable critical habitat lands for Sharp-tailed Grouse already owned by the Crown. Actual purchase of those lands will not be necessary. Alternative critical habitat for white-tailed deer may have to be purchased.

Estimated Mitigation Cost:

- Designate 5 quarter-sections

Crown land at no cost to purchase (Sharp-tailed Grouse) and 5 quarters @ $40,000/quarter (white-tailed deer) $200,000

.5 Create Alternative Wetlands:

To mitigate the loss of permanent wetlands such as the marshes along the Souris River south of Dead Lake, there are a number of possibilities for creation of new, alternative wetlands, by way of dikes and pumping, near the Full Supply Level of the reservoir. As some of these potential sites may already be providing important habitat for Ring-necked Pheasants, Sharp-tailed Grouse and white-tailed deer, only those areas with minimum conflict and maximum potential should be considered for wetland development. Potential sites will be investigated in detail by the Authority with officials of Saskatchewan Parks, Recreation and Culture and representatives of organizations such as Ducks Unlimited Canada and the Saskatchewan Wildlife Federation.

Two specific commitments are made by the Authority which will not conflict with existing upland habitat when the reservoir is established. These include:

i) the creation of permanent wetlands above and below supergrid #705 within the Souris River Valley, i.e. the extreme upper end of Rafferty Reservoir, and

ii) creation of three small wetlands and preservation of habitat within the Dead Lake Channel west of supergrid #606.

a) Create Wetlands Above and Below #705 on Souris River (Upper Rafferty)

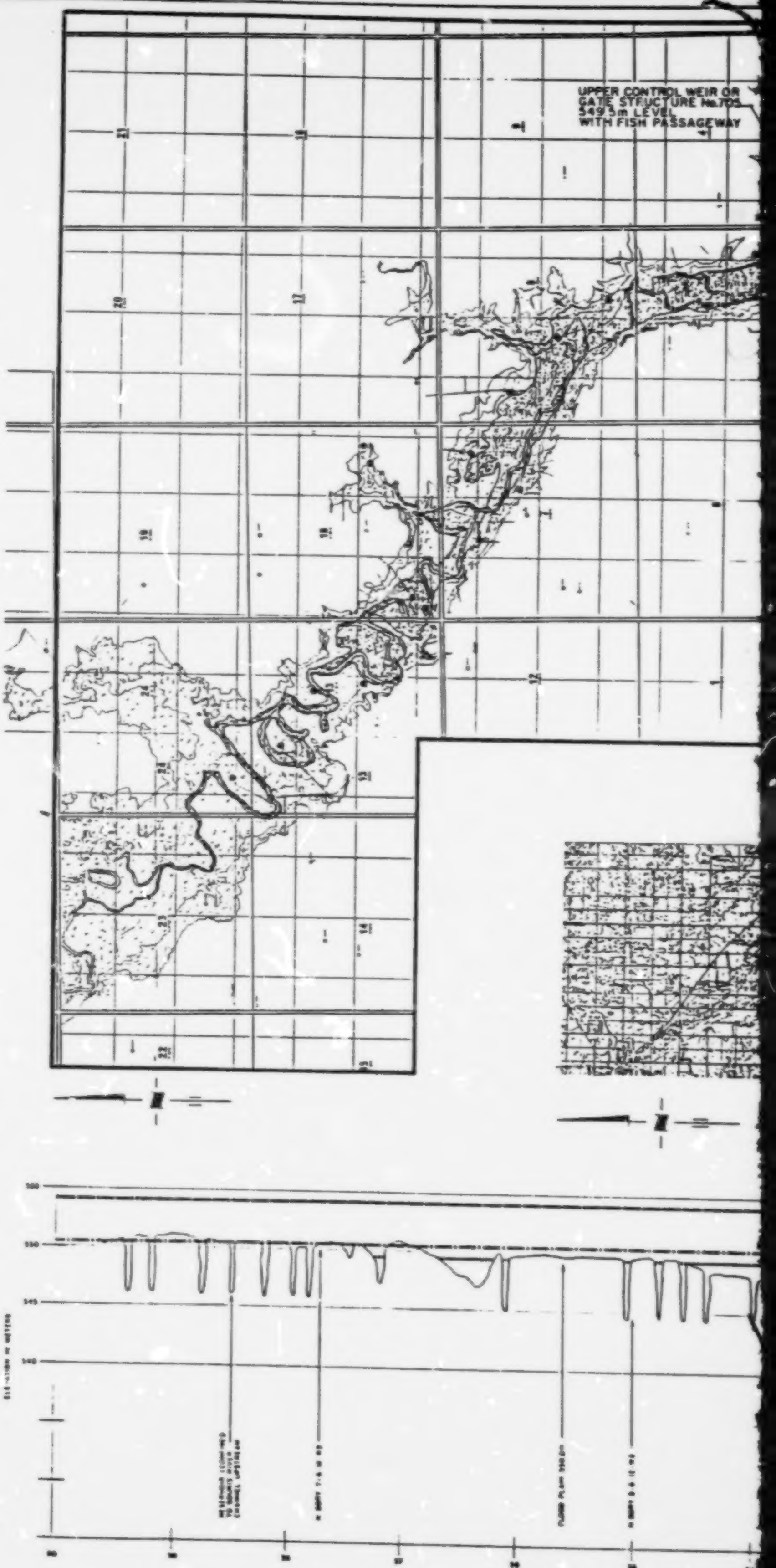
Holding the reservoir at the 549.5 m elevation above #705, and at elevation 548.5 below #705 for 3 km downstream, would prevent the establishment of exposed lake bottom when the water level in the reservoir drops to 547 meters or less (Figure 11). Through the use of control structures or weirs, permanent wetlands (215 ha) can be created for waterfowl production and staging. Production estimates of 1.0 to 1.5 broods per hectare are envisaged in this area for all water surface less than two metres deep.

Super Grid #705 has to be raised approximately 3 m to attain an elevation above the maximum flood level of 554 m. A control structure or weir will be added above the two existing 5 m diameter culverts to hold water at or near Full Supply Level. Some islands will also be created to increase productivity within the wetlands. Diking around some of the existing oil wells in the area will be undertaken as part of the oil well mitigation costs. No additional land is required as the development is within the Full Supply Level of the reservoir. Ducks Unlimited Canada will be approached to undertake the island enhancement. A second weir, within or at the south boundary of section 29, Twp 5, Range 12, W 2nd M will be constructed to hold the lower pond at an elevation of approximately one meter below Full Supply Level, i.e. 548.5 m. These wetlands will be important for outdoor education and bird watching as well as waterfowl production. Figure 12 is an artistic depiction of this wetland.

Wetlands such as these have been created by the United States Fish and Wildlife Service in the Souris River Valley at the Upper Souris Wildlife Refuge and the J. Clark Salyer Refuge, and have proven over the past 50 years or so to be extremely productive. The Authority will seek the advice and assistance of the U.S. Fish and Wildlife Service and Ducks Unlimited Canada to ensure optimum results with these developments.

Mitigation Costs:

- land acquisition (part of reservoir)	(nil)
- fencing 16 km @ $2,000/km	$ 32,000
- island development (in cooperation with Ducks Unlimited Canada)	10,000
- #705 Control Structure	60,000
- 2nd Weir South of #705	70,000
- permanent habitat improvement	20,000
Total	$192,000


UPPER CONTROL WEIR OR
GATE STRUCTURE No.705
549.5m LEVEL
WITH FISH PASSAGEWAY
21
19
20
17
19
18
12
550
545
540
DISTANCE UPSTREAM RAFFERTY DAM

SOURIS RIVER VALLEY PR

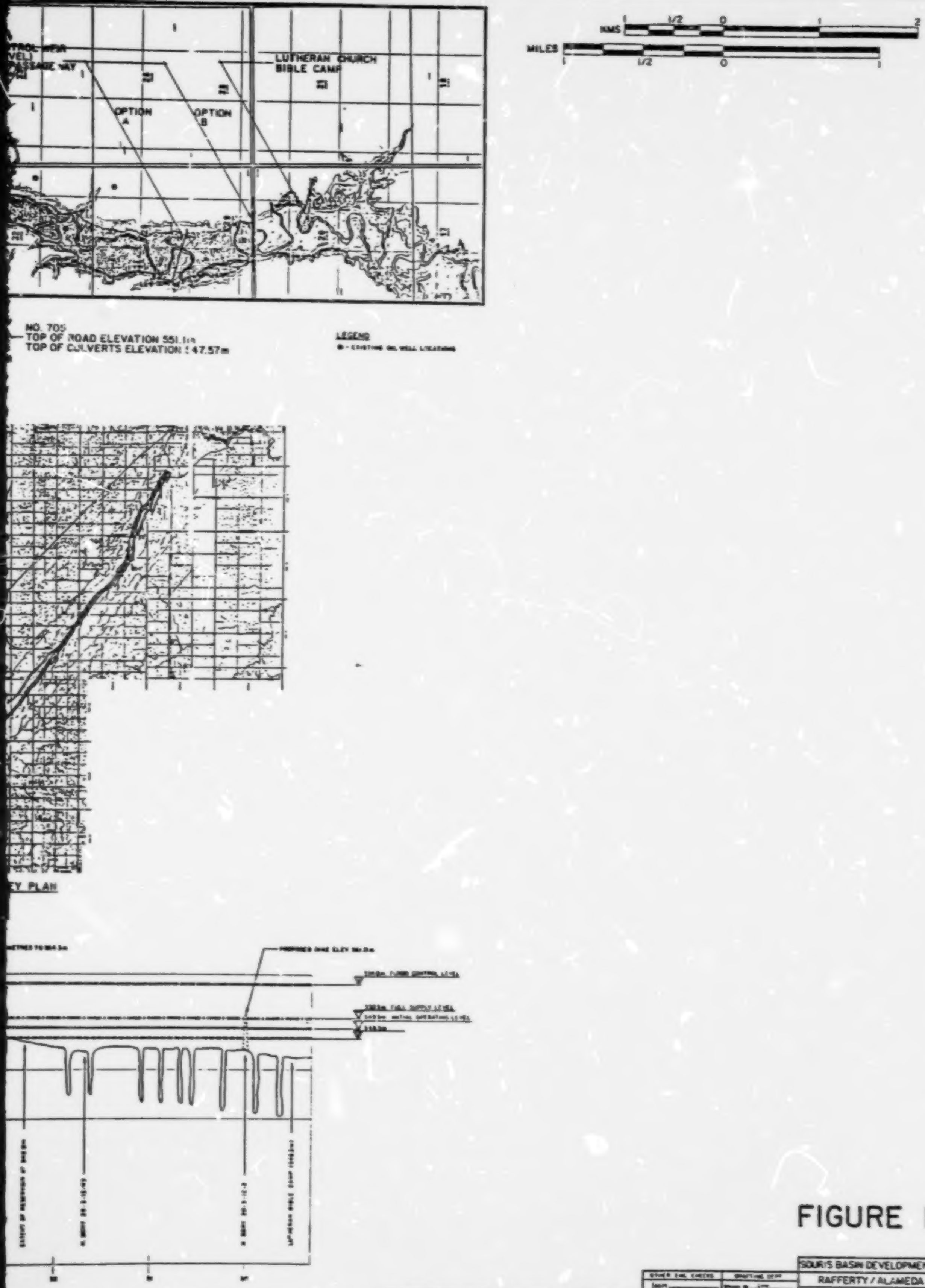
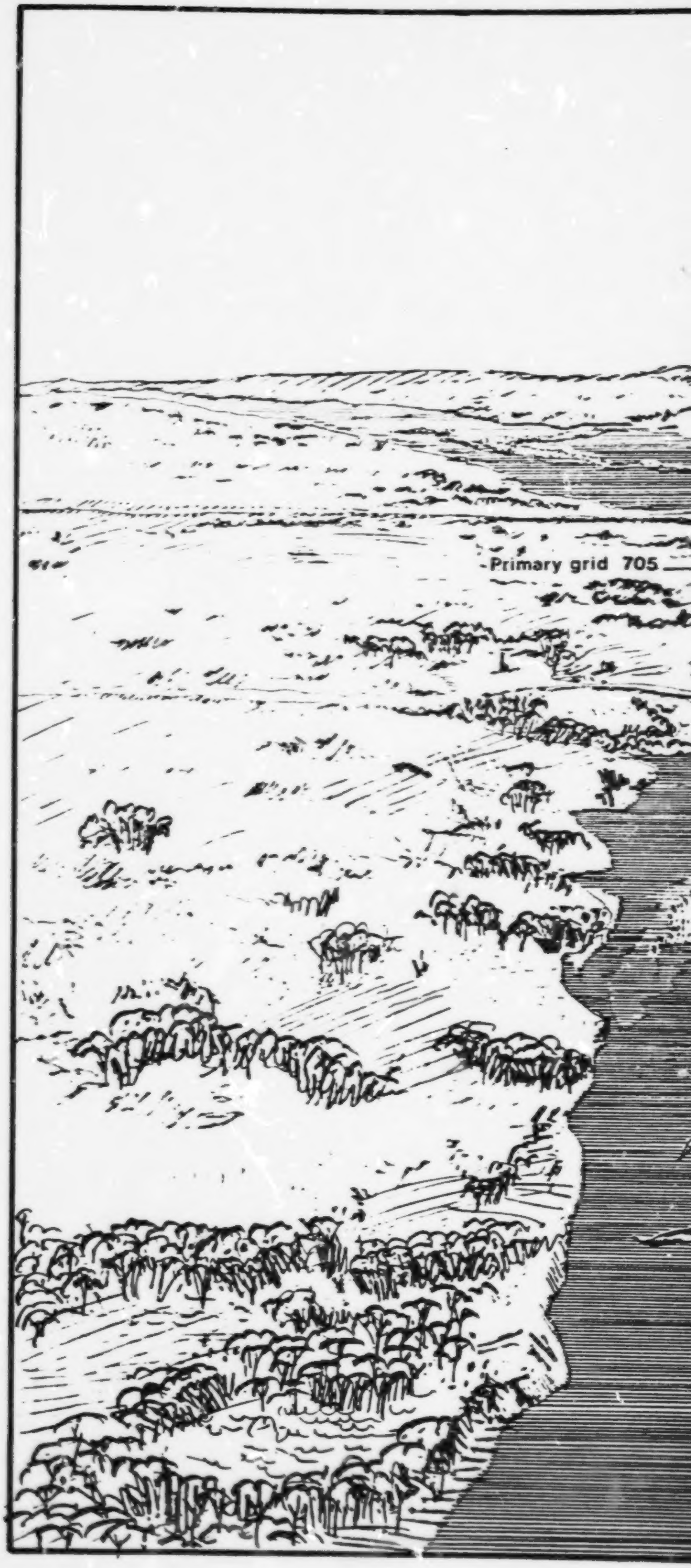

KMS
1
1/2
0
1
2
MILES
1
1/2
0
1
TROL WEIR
VEL)
PASSAGE WAY
LUTHERAN CHURCH
BIBLE CAMP
OPTION
A
OPTION
B
NO. 705
TOP OF ROAD ELEVATION 551.1m
TOP OF CULVERTS ELEVATION 547.57m
LEGEND
● - EXISTING OIL WELL LOCATIONS
EY PLAN
PROPOSED DIKE ELEV
FLOOD CONTROL LEVEL
FULL SUPPLY LEVEL
INITIAL OPERATING LEVEL

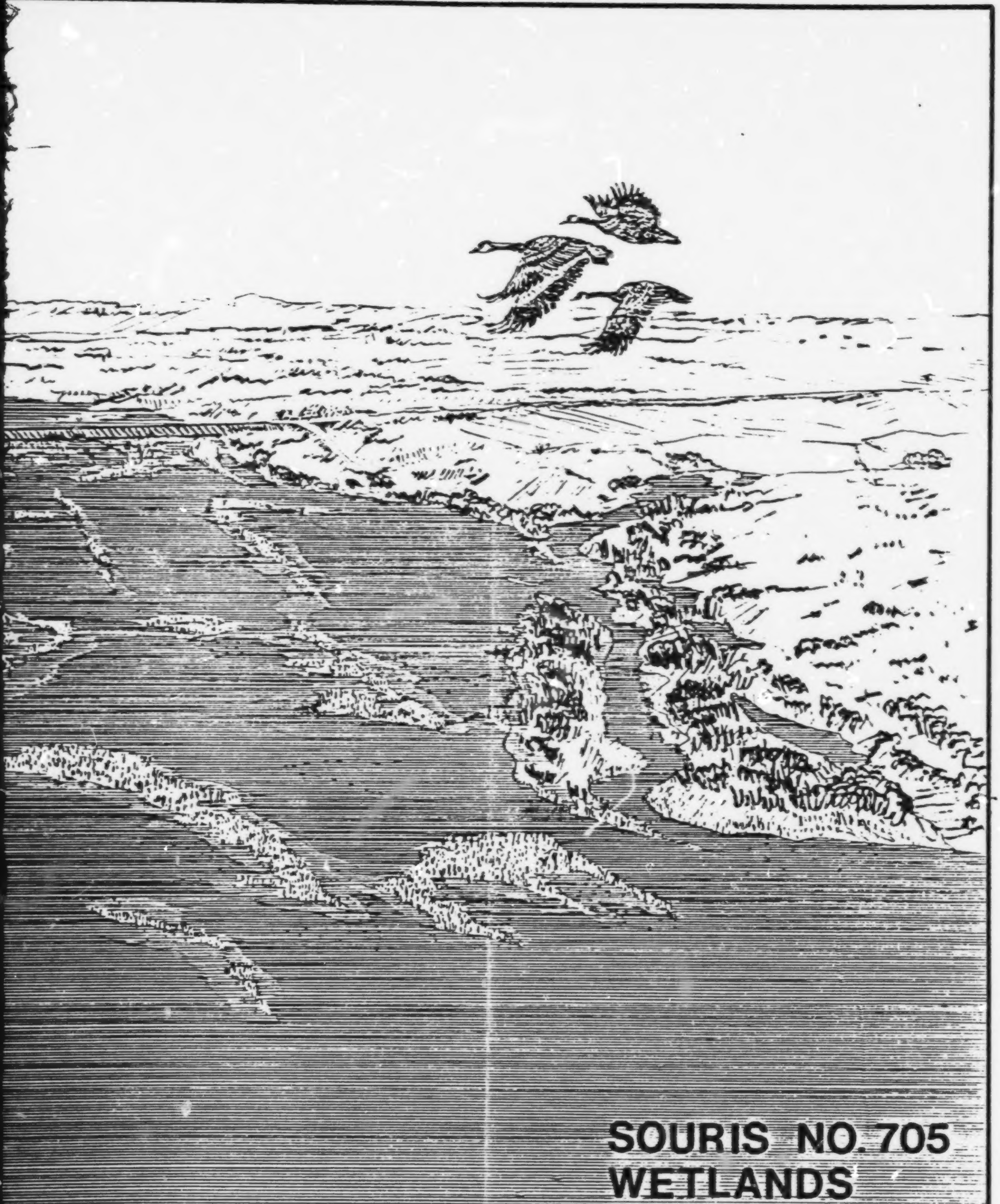
FIGURE 11

SOURIS BASIN DEVELOPMENT AUTHORITY

RAFFERTY / ALAMEDA PROJECTS

RAFFERTY DAM
RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
UPPER RAFFERTY -
NO 705 WETLANDS


Primary grid 705



SOURIS NO. 705 WETLANDS
VIEW FROM THE SOUTH
FIGURE 12

PHOTO SIXTEEN: Waterfowl staging on wetlands in Souris River Valley, near Lake Darling, North Dakota.
(Photo courtesy U.S. Fish & Wildlife Service)

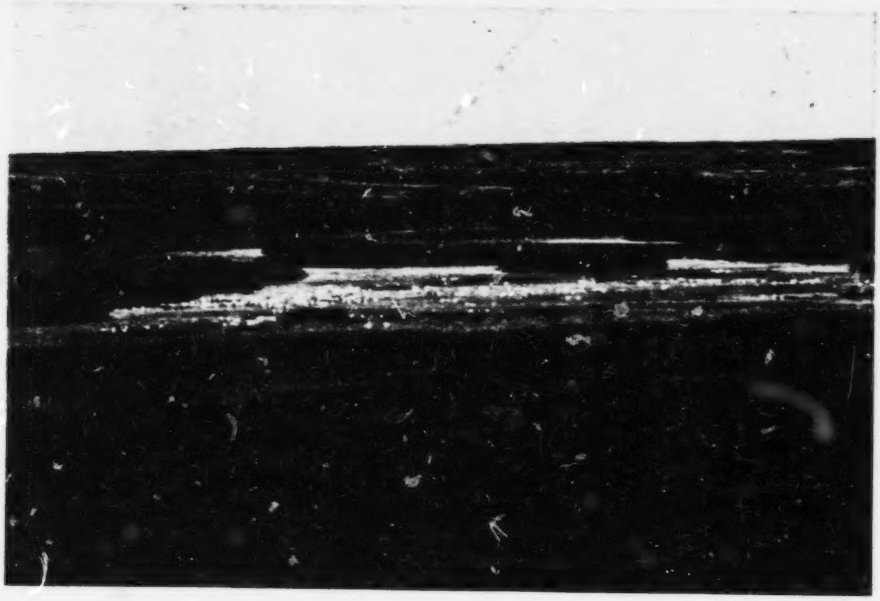


PHOTO SEVENTEEN: Waterfowl staging on wetlands, Souris River Valley, North Dakota.
(Photo courtesy U.S. Fish & Wildlife Service)

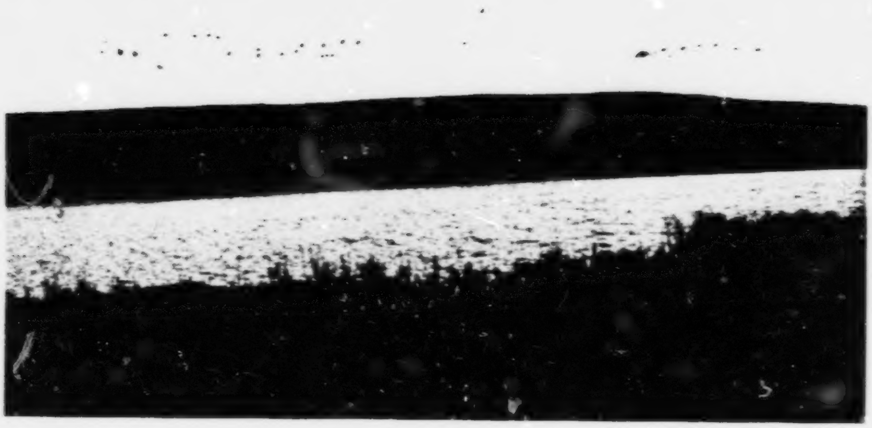


PHOTO EIGHTEEN: Canada Geese at McDonald Lake.
(Photo courtesy SBDA)

PHOTO NINETEEN: Canada Goose nest.
(Photo courtesy Environmental Management Associates)

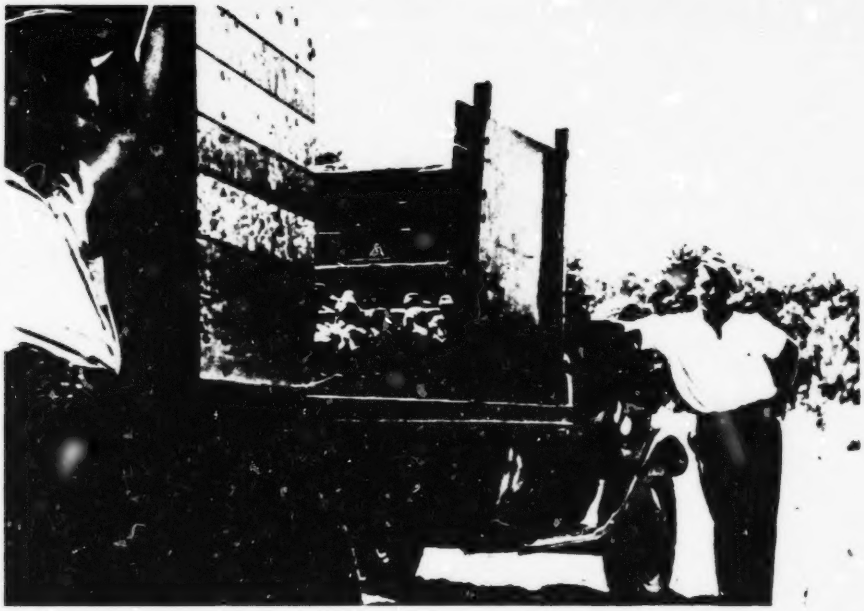


PHOTO TWENTY: Establishing waterfowl in wildlife refuge at Lake Darling, North Dakota in Souris River Valley in 1930's.
(Photo courtesy U.S. Fish & Wildlife Service)

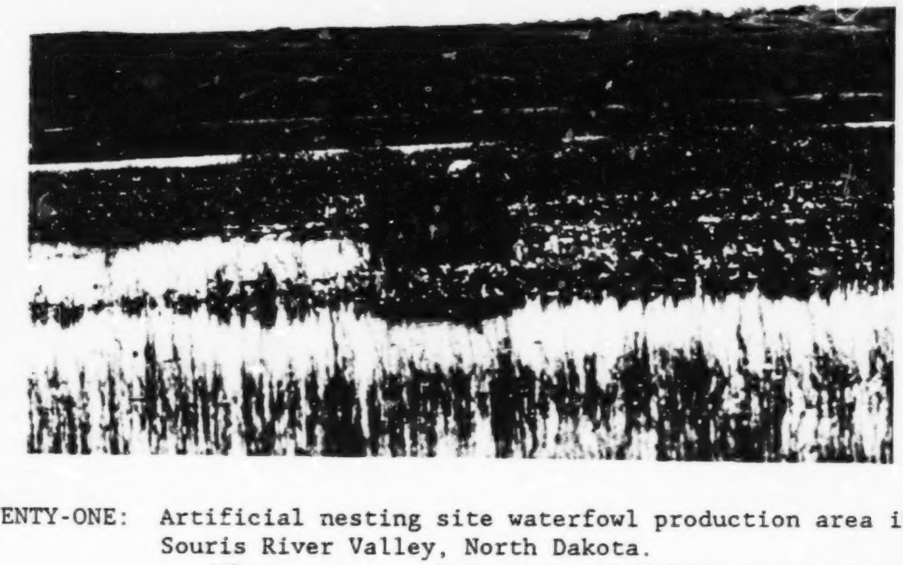


PHOTO TWENTY-ONE: Artificial nesting site waterfowl production area in Souris River Valley, North Dakota.
(Photo courtesy U.S. Fish & Wildlife Service)

b) Creation of Wetlands and Preservation of Wildlife Habitat in the Dead Lake Channel:

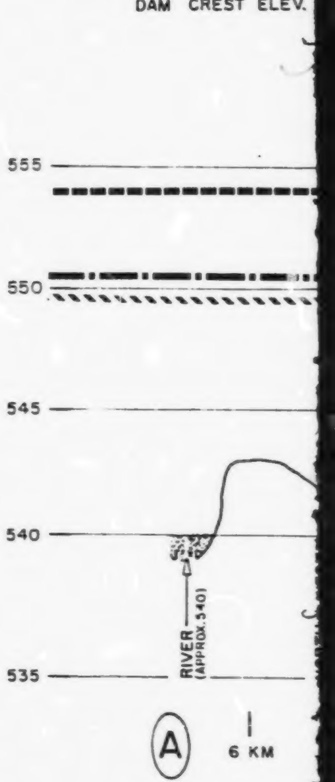
Approximately 115 ha of critical habitat can be saved and enhanced by converting the #606 causeway across the Dead Lake Channel to a dam with a second closure dam 5 km upstream, to the west. Three small wetlands can be established and maintained with inflow from Rafferty Reservoir at the west end. Shrub and tree planting between the wetlands can enhance cover and food supplies for a variety of species.

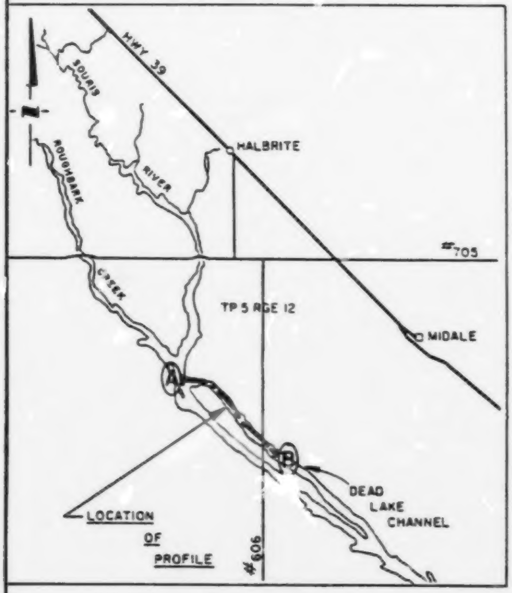
The easterly 'closure' dam at #606 is required in any event as a rip-rapped causeway would be required above Flood Level of 553.5 m to accommodate the relocated Super Grid. The westerly closure dam will be approximately 200 meters wide, also constructed above flood level to provide a suitable location for the relocation of Dr. Mainprize Regional Park. As shown in Figure 13, the western end of this portion of the Dead Lake channel is 5 meters higher than the eastern end, at Elswick Lake, near #606. Water can be released from Rafferty Reservoir to flow through the park. It will flow by gravity through two ponds before reaching Elswick Lake. The elevation of the water in each of the two upper wetlands will be controlled through the use of small weirs. Elswick Lake will be at the lowest end of this small drainage basin.

Approximately 13.5 km^2 of adjacent uplands drain into this portion of the Dead Lake Channel. To ensure that water flows can be maintained and to ensure fresh water, a pumping station will be required at #606 to pump excess water back in to the Rafferty Reservoir. The entire area will be fenced to exclude cattle from the adjacent Midale Pasture.

Mitigation Costs:

- The western closure dam is an indirect cost related primarily to the relocation of Dr. Mainprize Regional Park. Significant wildlife benefits valued at $200,000 will accrue as well. These benefits have not been included in the wildlife mitigation costs.
- All land is crown land, part of the Midale Pasture. If the wetland/park development were not involved, the entire area would be purchased and inundated by the Rafferty Reservoir. (Therefore, no additional costs.) (nil)

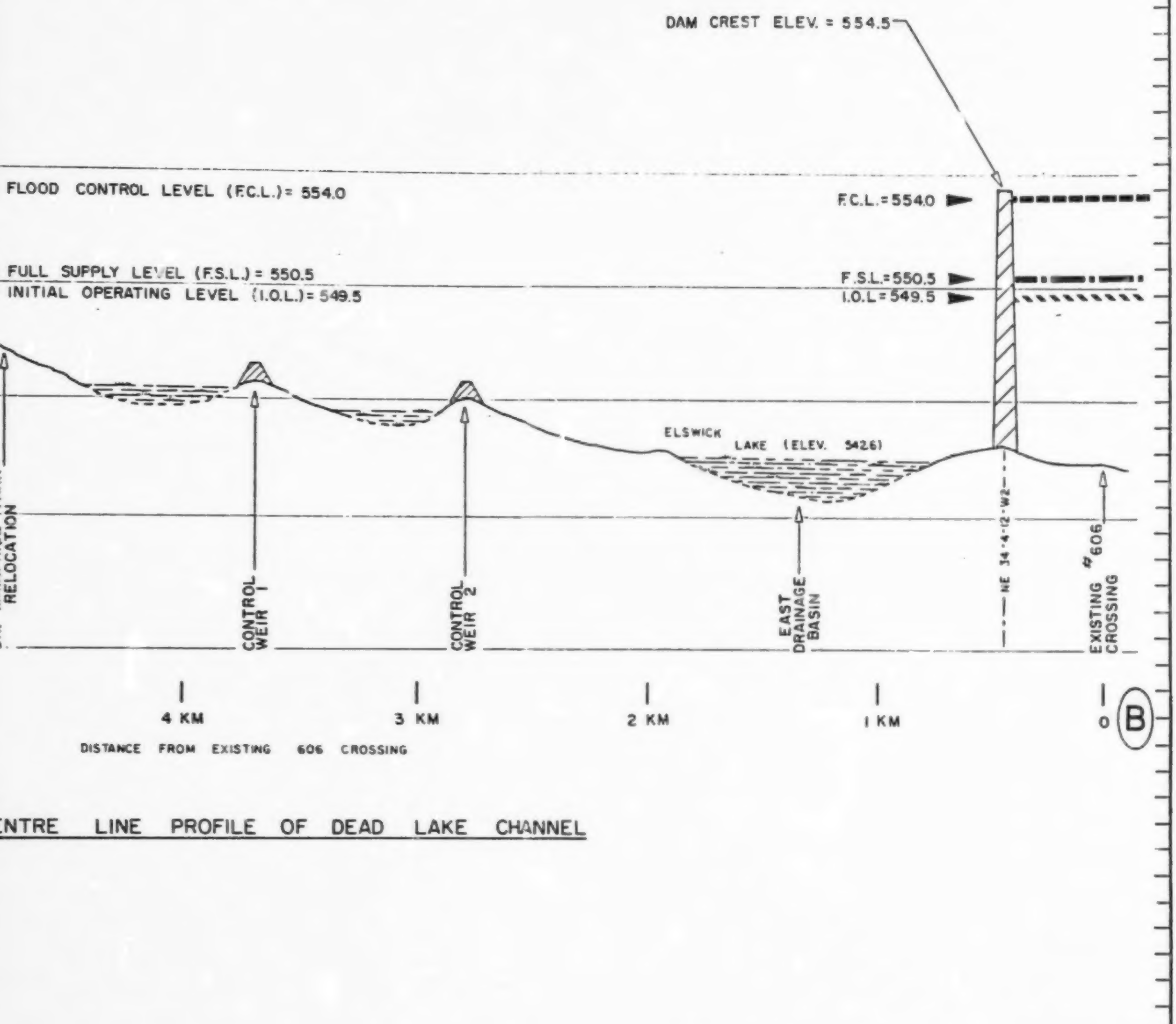

DAM CREST ELEV.
555
550
545
540
535
ELEVATION IN METRES
RIVER (APPROX. 540)
A
6 KM


HWY 39
SOURIS
RIVER
ROUGHBARK
CREEK
HALBRITE
#705
TP 5 RGE 12
MIDALE
A
B
DEAD LAKE CHANNEL
LOCATION OF PROFILE
#606

KEY PLAN

	DEPT	APP'D			DEPT	APP'D			DEPT	APP'D	
				REV.				REV.			

DOE-SPC


DAM CREST ELEV. = 554.5
FLOOD CONTROL LEVEL (F.C.L.) = 554.0
FULL SUPPLY LEVEL (F.S.L.) = 550.5
INITIAL OPERATING LEVEL (I.O.L.) = 549.5
F.C.L.=554.0
F.S.L.=550.5
I.O.L=549.5
ELSWICK LAKE (ELEV. 542.6)
RELOCATION
CONTROL WEIR 1
CONTROL WEIR 2
EAST DRAINAGE BASIN
NE 34-4-12-W2
EXISTING CROSSING #606
4 KM
3 KM
2 KM
1 KM
0
B
DISTANCE FROM EXISTING 606 CROSSING

ENTRE LINE PROFILE OF DEAD LAKE CHANNEL

FIGURE 13

SOURIS BASIN DEVELOPMENT AUTHORITY

RAFFERTY / ALAMEDA PROJECTS

RAFFERTY DAM
RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
DEAD LAKE CHANNEL PROFILE

PROP.	UNIT	SYST.	FUNC.	SERIAL	REV
A435	1	40	RVR	001	A

	DEPT	APP'D		
	DRAFT		GMM	87/03/13
REV.				REV.

OTHER ENG. CHECKS
DEPT
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CHK'D BY
DATE
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CHK'D BY
DATE

DRAFTING DEPT.
DRAWN BY GMM
CHK'D BY
DATE 87-03-13
SCALE

DESIGN DIVISION
DEPT
DESIGNED BY
CHK'D BY
APP'D BY
DATE

- Water release mechanism from westerly dam and canal improvements	$30,000
- fencing - 10 km @ $2,000	20,000
- Two small weirs to control wetland elevations	34,000
- Power supply, pump and pipeline to remove excess water from Elswick Lake over #606 back into Rafferty or to flush wetlands	35,500
Total	$119,500

.6 Coal Spoil Areas East of Estevan

A number of old coal mine spoil piles have become significant habitats for a variety of wildlife species in the Estevan-Bienfait area. While some of these areas had only the upper formation of coal removed, there is now potential for economically re-mining these areas to remove a second, deeper bed of coal.

The coal spoil piles south of the Souris River, west of Roche Percee will be re-mined in 25 or 30 years. With the proposed Shand Power Station located north of the River, it is likely that all coal surrounding the plant, north of the river, will be mined first. Current reclamation regulations require that the spoil piles be leveled to agricultural standards. One large area north of Highway 39, between Estevan and Bienfait will not be re-mined as the deeper coal seams are not economic to uncover.

There may be a number of such spoil areas which could be acquired or designated for wildlife in their present state rather than leveled off and reclaimed and seeded for pasture or grazing land. Many small lakes and ponds with intervening ridges, now partially revegetated, could be permanently set aside for wildlife. Some of the existing spoil piles south of the Souris River may be designated as habitat for about 25 years, until they are re-mined, then traded for other lands which are now being mined and then reclaimed, to standards more suited to wildlife habitat. Department of Parks, Recreation and Culture and local members of the Saskatchewan Wildlife Federation could assist with plans for selection, designation and management of such lands. The Souris Basin Development Authority is committed to working with the area Coal Companies and the Saskatchewan Wildlife Federation to maximize the potential of these lands for wildlife.

Mitigation Costs:

- Fencing	
12 km @ $2,000/km	24,000
- Posting	2,000
- Habitat improvements	30,000
Total	$56,000

.7 Ecological Reserves/Natural Areas in the Souris River Valley downstream from Estevan

There is very good potential for creating an ecological reserve in the Souris River Valley downstream from Estevan as this reach of the river includes some of the area's best undisturbed habitat. The International Biological Program identified a candidate area in the valley, referred to as the Pinto-Souris natural area, number 71-22. An area of 8,985 ha along the Souris River was first proposed, 15 km downstream from Roche Percee. This International Biological Area was never established. A review of the proposal in 1985 by Saskatchewan Parks, Recreation and Culture suggested reduction of the area to 631 ha, a fraction of the original proposal (Figure 14). Further investigations suggest there may be other more suitable sites worthy of preservation and designation under the Ecological Reserves Act. As the Act is restricted to designation of provincial Crown Land, the Authority will identify and acquire, if necessary, a suitable portion of the Souris Valley ecosystem. Preservation of a natural area or areas in this manner should help offset some of the losses of native ecosystems in the Souris Valley upstream from the Rafferty dam. The Authority will undertake an inventory of available natural areas in the summer and fall of 1987 in order to select suitable candidate areas. The Saskatchewan Natural History Society, Saskatchewan Environment, Saskatchewan Parks, Recreation and Culture and other interest groups will be consulted. It should be noted that the Souris River channel improvements downstream from Rafferty to the Shand Power Station will have no significant impact on the selection of candidate areas further downstream.

Mitigation Costs:

- land purchase (if required)	$120,000
- fencing/posting	20,000
Total	$140,000

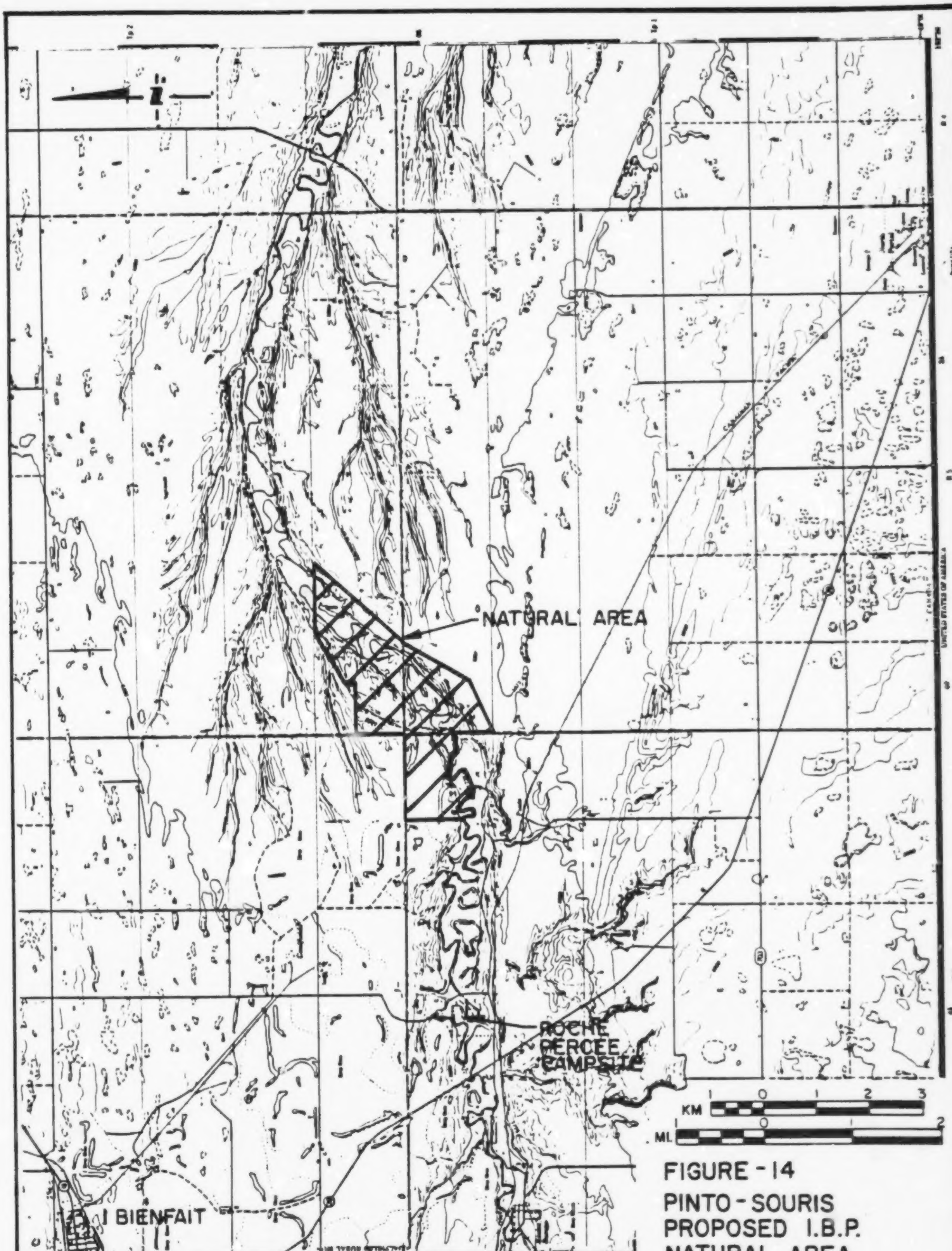

NATURAL AREA
ROCHE PERCEE CAMPSITE
BIENFAIT
KM 1 0 1 2 3
MI. 1 0 1 2

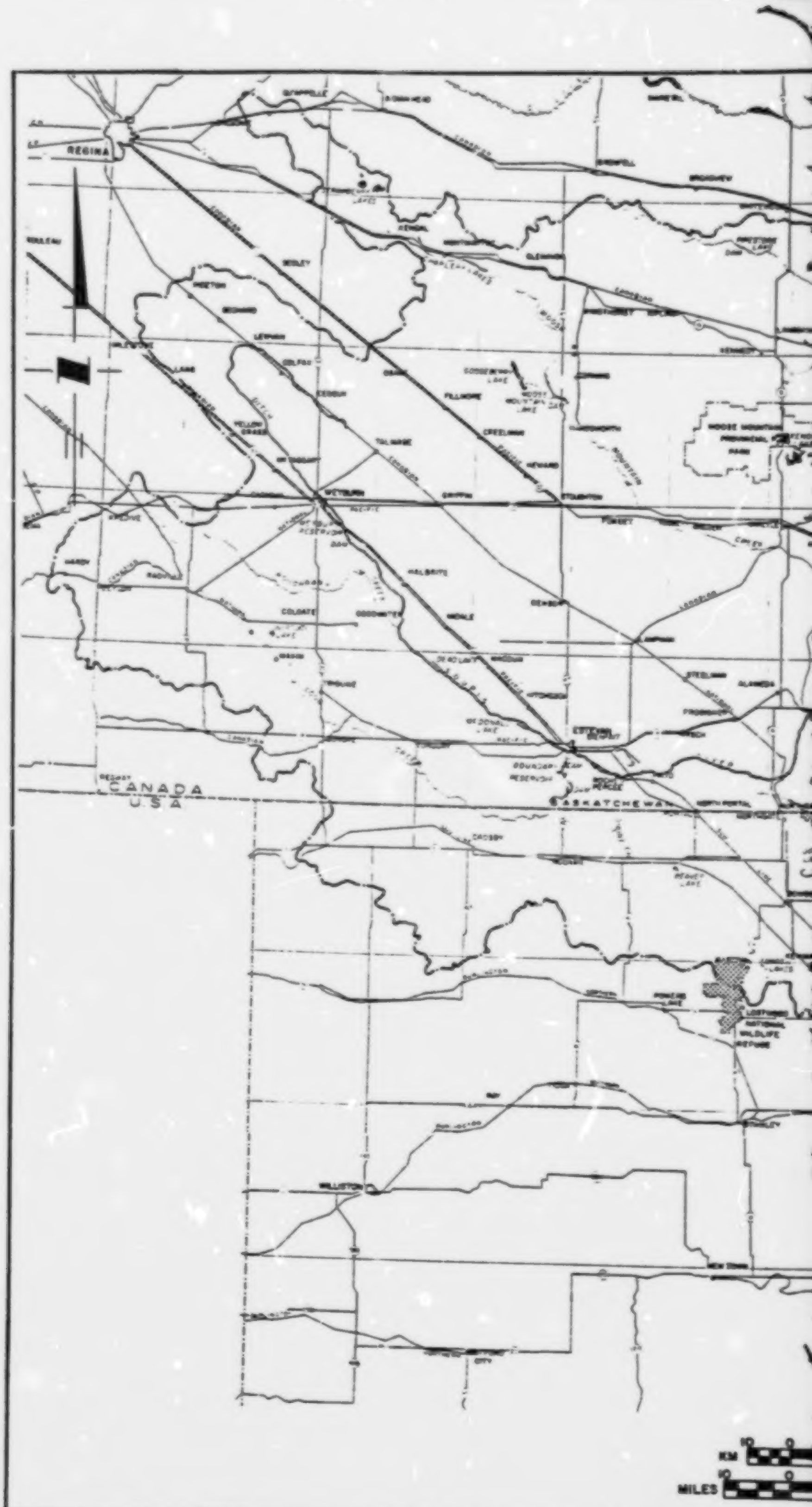
FIGURE - 14
PINTO - SOURIS
PROPOSED I.B.P.
NATURAL AREA
(REVISED)

.8 Downstream Wildlife Habitat Enhancement

One of the potential benefits of the Alameda and Rafferty dams will be the ability to improve certain wildlife habitats downstream in the Souris River Valley, as has been accomplished along the Souris River in North Dakota by the U.S. Fish and Wildlife Service over the past 50 years. The Souris River has a history of erratic flows associated with either extreme excesses or lack of surface runoff. With the ability to better manage downstream flows, the riverine environment can become one of lesser extremes with, for example, oxbows and temporary wetlands being managed to permanently retain their wetland characteristics. The diversity of flora and fauna in this downstream reach of the valley can be supported by the water flows which will be necessary to satisfy the U.S. apportionment requirements. In other words, Saskatchewan can maximize the use of this water before it leaves the province. This future flexibility and multiple use of the water resources of the Souris Basin has not been and would not be possible without the upstream storage afforded by the Rafferty and Alameda dams.

Figure 15 graphically illustrates the location of various National Wildlife Refuges along the Souris River throughout North Dakota. These refuges were first established in the 1930's to serve as important feeding and resting areas for the thousands of waterfowl which annually migrate through the Central Flyway. A number of wildlife habitat improvements have been made along the Souris River at various locations downstream from these larger reservoirs and impoundments. These off-reservoir improvements should be looked upon as examples for Saskatchewan. It is not suggested that further impoundments or extensive wetlands are required for the downstream reaches of the Valley. The ecology of the existing valley complex is valuable as is.

The wildlife refuges in the United States have been developed into important duck production areas. A series of low level dikes have been constructed to restore once threatened wetlands. The key to their success relates to the ability of American resource agencies to better manage the flows of the Souris River. Scenic auto trails have been developed to explain wildlife management programs and the environment of the Souris Valley. Canoe routes in certain reaches let visitors explore and enjoy the unique riverine woodlands and wildlife.


REGINA
WEYBURN
TALMAGE
FILLMORE
CREELMAN
STOUGHTON
HALBRITE
COLGATE
GOODWATER
MIDALE
STEELMAN
ALAMEDA
ESTEVAN
BOUNDARY DAM RESERVOIR
CANADA
U.S.A.
SASKATCHEWAN
NORTH PORTAL
CROSBY
MOOSE MOUNTAIN PROVINCIAL PARK
LOSTWOOD NATIONAL WILDLIFE REFUGE
WILLISTON
NEW TOWN
KM
MILES

DEPT	APP'D			DEPT	APP'D			DEPT	APP'D	

REV

REV

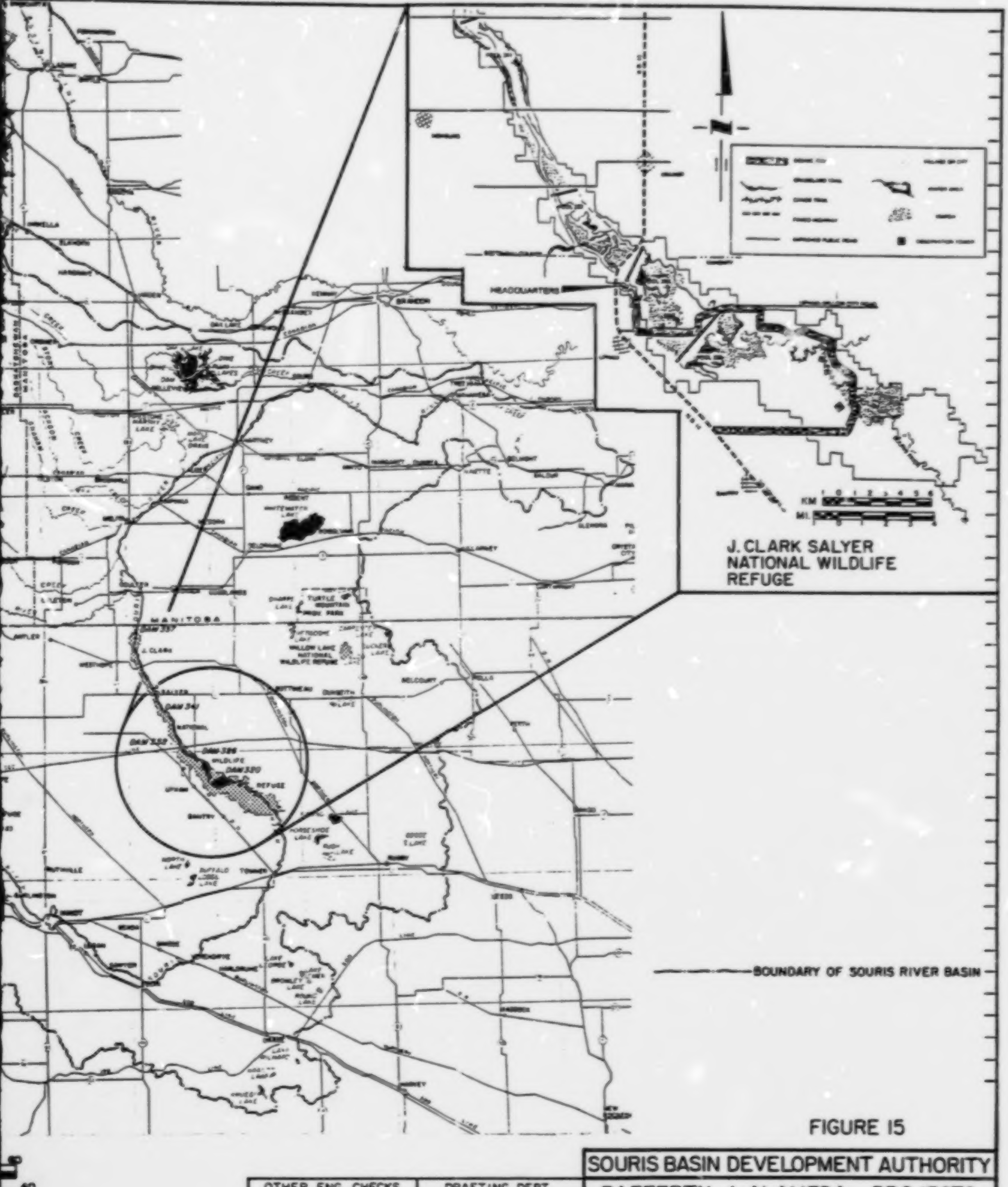

J. CLARK SALYER
NATIONAL WILDLIFE
REFUGE
HEADQUARTERS
KM
MI.
MANITOBA
DAM 357
J. CLARK
DAM 341
NATIONAL
DAM 332
DAM 326
WILDLIFE
DAM 320
REFUGE
UPHAM
BANTRY
TOWNER
TURTLE MOUNTAIN
WILLOW LAKE NATIONAL WILDLIFE REFUGE
WHITEWATER LAKE
BOUNDARY OF SOURIS RIVER BASIN

FIGURE 15

	DEPT	APP'D		
	DRAFT		D.F.K. 87-05-22	
REV.				REV A

OTHER ENG. CHECKS

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CHK'D BY
DATE

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DATE

DRAFTING DEPT.

DRAWN BY D. Kozoriz
CHK'D BY S
DATE 87-05-22
SCALE

DESIGN DIVISION

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DESIGNED BY
CHK'D BY
APP'D BY
DATE

SOURIS BASIN DEVELOPMENT AUTHORITY

RAFFERTY / ALAMEDA PROJECTS

RAFFERTY / ALAMEDA DAMS
RESERVOIRS
LOWER SOURIS RIVER BASIN
SHOWING NATIONAL WILDLIFE
REFUGES IN NORTH DAKOTA

PROP.	UNIT	SYST.	FUNC.	SERIAL	REV
A 4 3		1 4 0	R V R	0 0	A

Birdwatching, photography, fishing, hunting, picnicking and other suitable recreational activities are encouraged at appropriate times of the year. Observation towers, visitor reception areas, pamphlets, photographs and other means have been successfully used to educate and to explain the various conservation and management objectives and programs of the U.S. Fish and Wildlife Services.

Although no major wetlands are proposed for the lower reaches of the Souris, similar potential in Saskatchewan will be enhanced by the Rafferty and Alameda reservoirs. Saskatchewan Parks, Recreation and Culture, the Saskatchewan Natural History Society, Saskatchewan Wildlife Federation, Ducks Unlimited Canada and other conservation groups will be encouraged to work with the Souris Basin Development Authority to realize this potential through a long term development and management plan for this reach of the Souris River Valley. The United States Fish and Wildlife Service have offered to provide whatever advice and technical expertise it can, in this regard, based on its experience in the Souris River Valley. To assist with the necessary additional background research and the preparation of a long-term plan, the Authority will contribute $50,000 in addition to other information, such as aerial photographs and maps and baseline data currently being assembled as part of the Environmental Impact Statement.

.9 Artificial Nest Structures - Raptors

Certain raptors such as the Ferruginous Hawk and Burrowing Owl are receptive to using artificial nesting structures (e.g., Houston 1982, 1985; Schmutz et al. 1984; Howard and Hilliard 1980; Zarn 1974; World Wildlife Fund pers. comm.). Where known nest sites of these "at risk" species will be disturbed artificial nest sites will be constructed within suitable, adjacent habitat. In some cases fencing may be required to protect existing nesting sites from cattle grazing. Several additional elevated nesting structures will be erected in suitable habitat with the intent of enhancing nesting habitat. Additional baseline data will be acquired to identify sites which may be affected by the Rafferty reservoir. Mitigation costs are anticipated to amount to $10,000 for additional baseline data collection, construction of structures and fencing of some existing sites.

.10 Wildlife and Waterfowl Depredation Prevention and Compensation Trust Fund

As with reservoirs and National Wildlife Refuges on the Souris River system in North Dakota, the Rafferty reservoir is expected to become a significant staging or visitation area associated with some major North American flyways. While nearby crops will have been harvested in most years before waterfowl concentrate in this area, inclement harvest weather or other delays in harvesting could combine to create significant potential depredation problems, primarily by Snow Geese.

As it is not possible to foresee exactly where or when lure crops or bait stations will be needed until after the reservoir fills, a Trust Fund will be set aside to meet such future needs. Existing programs of Saskatchewan Crop Insurance and Saskatchewan Parks, Recreation and Culture wildlife prevention and compensation programs (cost-shared 50-50 with the Federal Government) should not be expected to carry such additional potential depredation burdens.

The establishment of the reservoir will displace a number of white-tailed deer from traditional ranges within the Souris Valley. Some depredation of crops and haystacks and other agriculture-wildlife conflicts can be expected, especially in the short term reservoir filling period Fencing of haystacks and supplemental winter feeding of deer, especially during severe winters, may be necessary as well as development of food supplement crops such as sunflowers, sanfoin or alfalfa.

To address the future prevention and depredation problems, the Authority will establish a Trust Fund of $750,000, deemed sufficient to handle all costs associated with both reservoirs. As indicated by Saskatchewan Parks, Recreation and Culture, Wildlife Branch personnel, the average annual requirements of this fund are estimated to be $80,000 to $90,000 (Table 15).

The Trust Fund will be established immediately upon start of construction of the Rafferty Project. Interest on the initial $750,000 deposit will accrue in the Fund while the reservoirs are filling and ensure that adequate funds are available indefinitely for various types of payments. (The principal amount of $750,000 is not expected to be drawn upon, however it has been included in the direct benefit-cost analysis.) Bait and feeding stations will be established when and where the need arises. The local members of Saskatchewan Wildlife Federation and Saskatchewan Parks, Recreation and Culture will be requested to assist the Authority in an advisory capacity. The Fund will continue to be administered by

TABLE 15

Estimate of Average Annual Trust Fund Expenditures

Rafferty Reservoir Impacts

- Waterfowl Bait Stations (Prevention) 3 stations @ $5,000 (replace every 10 years)	$ 1,500
Operation of Bait stations ($4,000/yr x 3)	12,000
- Waterfowl Depredation (Compensation) $50,000/yr., 2 years in 10) $ 5,000/yr., 3 years in 10) (Total: $\frac{\$120,000}{10}$) $ 1,000/yr., 5 years in 10)	12,000
- Deer-proof fencing of haystacks 6 sites @ $3,500/site once every 5 years	4,200
- Deer feeding: $30/deer x 600 deer, 2 years in 10 (utilizing local volunteer labour as organized by Saskatchewan Wildlife Federation) i.e. no feeding during more normal years, 8 in 10	3,600
- Deer feeders ($10,000 capital replaced every 10 years)	1,000
- Staffing Requirements (vary from year to year) $30,000, 2 years in 10) (Total: $\frac{\$140,000}{10}$) $10,000, 8 years in 10)	14,000
- Travel, administration, miscellaneous expenses	6,700
TOTAL	$55,000

Alameda Reservoir Impacts

The estimate of annual expenditures associated with the Alameda reservoir will be dealt with in detail following the completion of the 1987 field investigations. Preliminary estimates based upon the elements in Table 15 suggest a range of $25,000 to $35,000 per year.

Therefore, Total Average Annual Expenditures from Trust Fund for both reservoirs equals $80,000 to $90,000.

Source: Saskatchewan Parks, Recreation and Culture whatever administrative organization is eventually established to succeed the Souris Basin Development Authority.

.11 Rafferty Reservoir Development and Management Guidelines

The lands immediately surrounding the Rafferty reservoir will continue to be very important for wildlife. In addition to fencing and elimination of conflicts such as grazing, and the establishment of special wildlife status and enhancement of islands and other areas, consideration of long-term wildlife benefits require sensitive management and development of the area around the reservoir. Restricting development of cottages to approved areas, limiting public access to acceptable areas of the shorelines, setting aside special areas for waterfowl nesting, brood rearing and moulting, and restricting power boats and all terrain vehicles in certain areas, will assist wildlife to adapt to the different lacustrine environment.

The form of the long-term management of these lands has not been finalized. Rural Municipalities, adjacent landowners and various provincial government departments (Saskatchewan Parks, Recreation and Culture, Environment, Agriculture, Rural Development) will be contacted to assist the Authority in coordinating wildlife objectives with all others in this multiple use project. The intent will be to develop long-term development and management guidelines which can be administered by some form of Conservation or River Valley Authority after the Souris Basin Development Authority's current development mandate has been fulfilled.

4 SUMMARY OF MITIGATION EFFORTS

The Authority estimates that 2,900 ha of land will be acquired, protected and/or enhanced for wildlife in the Rafferty Project Area as summarized below. This area does not include the lower Rafferty or Dr. Mainprize Regional Park lands which will also provide improved shelter and habitat once the trees become established, similar to those at the existing Regional Park. These new tree and shrub plantations will be many times the areal extent of all maples and tall shrubs which will be cleared for the reservoir. Their quality, usefulness and ultimate success as wildlife habitat will be dependent upon the species composition of trees and shrubs and the proper mix of food and shelter. Conifers, poplars and a variety of woody shrubs are proposed.

a)	Souris Valley habitat enhancement above Maximum Flood Level (food + trees + shrubs)	65 ha
b)	Portions of sections 30, 31-4-11-2 in Midale Pasture	200 ha
c)	10 block plantations around perimeter of Reservoir	120 ha
d)	Long Creek habitat enhancement	300 ha
e)	Dead Lake Channel between closure dams	150 ha
f)	Downstream Habitat protection	195 ha
g)	Perimeter fencing, cattle grazing reduction	610 ha
h)	Island habitats	400 ha
i)	Alternative Critical Wildlife Habitat Protected Lands	645 ha
j)	Wetlands @ #705	215 ha
	Total	2,900 ha (7,166 ac)

5 SUMMARY OF WILDLIFE MITIGATION COSTS

1)	a) Habitat improvements above Flood Level	$ 87,800
	b) Habitat improvements within Midale Pasture	138,500
	c) Scattered block plantations around reservoir	257,300
	d) Block plantations in Dead Lake Channel	50,150
	e) Long Creek Habitat enhancement	337,000
	f) Land acquisition/designation downstream	243,750
2)	Fencing/dugouts to reduce grazing habitat conflicts	148,000
3)	Island enhancements/fencing	70,000
4)	Alternative "Critical Wildlife Habitat"	200,000
5)	Alternative Wetlands	
	a) #705 wetlands north and south	192,000

	b) Dead Lake Channel	119,500
6)	Coal Spoil area enhancement	56,000
7)	Ecological Reserves (downstream)	140,000
8)	Downstream wildlife enhancement, research and management plan	50,000
9)	Artificial nest structures and fencing	10,000
	Sub-Total	2,100,000
10)	Operations and Maintenance (over 10 years)	375,000
11)	3 yr. Sharp-tailed Grouse Ecological Study	93,500
12)	3 yr. white-tailed deer Ecological Study	269,000
13)	Monitoring and Related Baseline Data Collection	200,000
14)	Wildlife Depredation Prevention and Compensation Trust Fund	750,000
	Sub-Total	1,687,500
	TOTAL	$3,789,500

6 OTHER CONCERNS

a) The Saskatchewan Wildlife Federation and Ducks Unlimited Canada have raised the concern that the creation of the Rafferty Reservoir could ultimately lead to additional upland drainage within the Basin and further loss of regional wildlife habitat, particularly wetlands. There are two or three relatively large agricultural drainage proposals in the upper reaches of the Basin which have not been approved because of potential increased flood problems in Weyburn and further downstream during high flow years. The primary reason for not issuing approval may thus be removed after the Rafferty Dam is in place. While the Authority acknowledges this concern, it is a problem which must be addressed by these organizations in consultation with the provincial government Wetlands Committee which comprises representatives from Saskatchewan Water Corporation, Saskatchewan Environment, Saskatchewan Parks, Recreation and Culture and Saskatchewan Agriculture.

The majority of physically and economically feasible upland drainage projects in the Basin have already been undertaken. The continuation of the work of the

Wetlands Committee is required as is a continued emphasis on conservation education. As in the past, each drainage proposal must be dealt with on its own merits.

The Authority's current mandate does not permit it to independently veto or otherwise rule on such upland drainage proposals. To this end, the Authority has not made any provision in the surface hydrology portion of this Environmental Impact Statement for increasing the water supply for the Rafferty Reservoir by including water from additional drainage projects. The Authority will have a representative on the Wetlands Committee when dealing with any proposal within the upper Souris drainage basin.

b) Another stated concern relates to the availability of public access to lands surrounding the reservoir for the "sportsman". Residential, cottage, commercial, institutional, recreational and other land uses will be restricted to appropriate sites to ensure the availability of other areas for public access and hunting at approved times of the years. In addition, use of some coal spoil areas may be obtained by agreement with landowners or lessees.

c) A third concern relates to potential loss of additional wildlife habitat downstream due to future more intensive agricultural uses, irrigation, and river channel improvements such as diking, tree clearing or dredging. This issue is currently being considered through detailed inventories of flora and fauna, and habitat assessment. Acquisition and designation of Critical Wildlife Habitat Protection Areas, establishment of Natural Areas and Ecological Reserves, and enhancement or protection of wetlands and other areas downstream will be addressed through the research and planning proposed above, as well as in the ongoing monitoring program.

7 MONITORING

The Souris Basin Development Authority will develop a comprehensive monitoring program in consultation with all interested wildlife groups such as the Saskatchewan Wildlife Federation, Ducks Unlimited Canada, the Saskatchewan Natural History Society and wildlife officials of Saskatchewan Parks, Recreation and Culture.

Fundamental to developing such a monitoring program is the need to complete any additional baseline data collection required to provide a basis for the planning and evaluation of all future mitigation efforts. Specifically, the Authority recognizes the need to undertake additional ecological research and population survey to further document deer wintering areas in and adjacent to the Rafferty Project Area. Recent mild winters have not permitted useful surveys to be undertaken. Similarly, additional ecological research will be undertaken to improve baseline data activities on Sharp-tailed Grouse, as previous discussed. Additional baseline data will be acquired in 1987 on waterfowl migratory patterns and non-game species such as amphibians/reptiles, raptors, furbearers and passerine birds. Although some useful information has been obtained with respect to Ferruginous Hawks and Burrowing Owls, additional data would be useful to provide an improved basis for evaluating artificial nesting sites and other habitat preservation/enhancement efforts such as reservoir fencing to reduce grazing/nesting conflicts.

Limited monitoring during pre-construction and construction activities would be useful to assess the impact of these activities on more sensitive wildlife such as raptors and Sharp-tailed Grouse during breeding activities.

Formal monitoring programs will be in place for the post-dam construction period. Monitoring activities will address:

i) utilization of the reservoir and shorelines by waterfowl and colonial nesting birds;
ii) utilization of all the alternative habitat (plantations, new wetlands, islands, artificial nest structures);
iii) assessment of crop depredation arising from increased waterfowl utilization of the reservoir;
iv) implications of modified Souris River flow regimes on the wildlife and habitat in the Souris River downstream of the Rafferty Dam to the U.S. Border.

Recognizing the need for additional baseline data on both game and non-game wildlife species, the Authority has commissioned further population and habitat baseline research for the reach of the Souris River Valley downstream from the Rafferty Dam. Terms of Reference for this work are appended (Appendix 2). This information gathering is ongoing in 1987 and data will be filed with Saskatchewan Environment in early 1988.

As the details of the full, long-term monitoring program remain to be finalized pending input from wildlife interest groups, no attempt has been made to itemize individual monitoring and associated baseline gathering activities. For the purposes of this Environmental Impact Statement, the Authority is committed to a total budget of not less than $200,000 for these monitoring activities over a period of not less than 10 years from start of construction.

In recognition of the importance of the Souris River Valley upstream of the Rafferty Dam site it is proposed that, as part of this additional baseline data gathering, the Authority will undertake additional waterfowl productivity analysis utilizing habitat evaluation procedures as described in Appendix 2. This habitat-based approach should yield far better results to form a basis for impact measurements on waterfowl productivity and appropriate mitigation action. Such a HEP study is estimated to cost approximately $20,000.

The Authority recognizes its responsibility to coordinate such additional baseline gathering and monitoring activities. The information, when collected, will be of considerable use in future educational, recreational, and tourism related interpretation programs.

The residents of Saskatchewan generally, and of the Souris River Basin specifically, will benefit from this additional effort to document and fully mitigate negative environmental impacts of this Project.

NON-MITIGABLE IMPACTS AND ENVIRONMENTAL TRADE-OFFS

1 INTRODUCTION

Despite implementation of a comprehensive mitigation and enhancement plan, some environmental impacts cannot be mitigated. Environmental trade-offs can be anticipated where the Project's negative impact upon a certain species or habitat will ultimately be deemed acceptable given the benefits potentially accruing to a variety of benefactors (including other wildlife) associated with project completion.

2 PRE-CONSTRUCTION AND CONSTRUCTION ACTIVITIES

Pre-construction and construction activities (excluding tree clearing) will be fairly localized (e.g., borrow material removal and surveying) and will result in minimal loss of wildlife habitat. It can be expected that some species will be temporarily displaced by disturbance associated with humans and vehicles.

3 OPERATION AND MAINTENANCE

It is obvious that the diversity and distribution of existing wildlife habitat, particularly that along the Souris River itself will be impossible to duplicate in the mitigation and enhancement plan. Nonetheless, the Authority is convinced that as a result of implementation of the comprehensive mitigation and enhancement plan, the habitat associated with game species, notably white-tailed deer, Sharp-tailed Grouse and Ring-necked Pheasants will suffer little net loss. The three-year ecologic studies should add considerable wildlife management knowledge for these species.

It is important to recognize that acre for acre mitigation simply does not recognize the quality of the habitats either with or without management or enhancement. While emphasis has been placed upon replacement of critical habitat for white-tailed deer, elimination of cattle grazing from around the reservoir shoreline will improve adjacent habitat for Sharp-tailed Grouse and Ring-necked Pheasants and other species. The quality of habitat for some species such as beavers and mink should also improve. The variety and complexity and interrelationships of habitat elements must also be recognized. These factors are considered in the HEP models to be used in the Alameda Reservoir area and downstream in the Souris River valley.

Numeric predictions of Project impact upon non-game wildlife such as reptiles and passerine birds have not been assembled, however additional work is being undertaken in 1987 utilizing the HEP models for species such as the Baird's Sparrow, Red-tailed Hawk, and western painted turtles. It is reasonable to expect that riverine habitat-oriented species (e.g., turtles) will experience negative impact when the Souris River Valley is converted to a lacustrine (lake) environment. Management and enhancement of riverine areas downstream of the reservoir will compensate for some of this lost habitat but it will not be feasible to physically replace the lost portion of the river valley and its associated habitat in an exact manner.

To ensure that adequate funding is in place to operate and maintain the $2.1 million capital mitigation efforts, the Authority is committed to an operation and maintenance budget of $375,000 over 10 years from start of construction. This is based upon the first 5 years at $25,000 per year and the second 5 years at $50,000 per year. This commitment recognizes that the Authority's initial mandate is to construct the Rafferty and Alameda Dams and reservoirs. As discussed elsewhere in this Statement, alternative or supplementary long-term management and development responsibilities will be worked out in consultation with local municipalities, various Provincial government departments and agencies as well as special interest groups. These responsibilities will include land and water resource management, development controls and authorities, and operations and maintenance of all works directly associated with the Project.

SUMMARY AND CONCLUSION

Almost all of the land to be flooded by the Rafferty reservoir is critical Sharp-tailed Grouse habitat, but it represents less than ten percent of all of the critical Sharp-tailed Grouse habitat on both sides of the Souris River Valley between Weyburn and Estevan. This areal extent valuation may not accurately reflect the true significance of the Souris River Valley within the ecological system of Sharp-tailed Grouse. The Authority will undertake a three year $93,500 ecological research study to obtain a better understanding of the relative importance of the topography and habitats within the complex Souris Valley system.

A considerable amount of critical and important white-tailed deer and Ring-necked Pheasant habitat will be lost as well as habitat for aquatic furbearers, coyotes, and several grassland species of birds and small mammals. Therefore, additional research on the ecology of white-tailed deer and additional baseline data is also proposed. This additional work has been estimated to cost $269,000.

Impacts on species such as western painted turtles and potential changes in wildlife travel and migration routes which follow the Souris River and tributary courses are also likely to be negative. Some lands protected by the Critical Wildlife Habitat Protection Act will be flooded. These will be replaced by alternative suitable lands. A comprehensive mitigation and wildlife habitat enhancement and development program will be undertaken by the Authority to offset the losses due to the Rafferty Reservoir. Over 2,250 ha of land will be specifically protected or enhanced for wildlife, including wetlands, islands in the reservoir, lands within the community pastures, along Long Creek, downstream on the Souris River and in the Dead Lake Channel. Additional land will be improved as wildlife habitat surrounding the reservoir due to reduced conflicts with cattle grazing. Park land developments at the relocated Dr. Mainprize Park and the lower Rafferty will further provide new habitat for wildlife, especially for wintering deer. Attention will also be focused upon the lower Souris River Valley downstream from the Rafferty reservoir where excellent potential exists for enhancement and protection through legislation including ecological reserves, natural areas and other means.

Creation of the Rafferty and Alameda reservoirs will provide new staging and resting areas for waterfowl and other shorebirds, thus improving waterfowl hunting, providing spectacular viewing opportunities and adding to tourism development opportunities. The reservoirs will change the species composition of the wildlife, especially birds, likely providing a greater diversity of shoreline and aquatic species. This could create, in time, a significant destination area for bird-watchers, photographers and naturalists.

Ecological research studies and mitigative measures for lost habitat will be initiated immediately upon approval to proceed with the project. This will ensure that displaced species of Sharp-tailed Grouse will have a better opportunity to adapt to the changed environment as the reservoirs fill. Because the implications to wildlife are quite diverse, and in some cases not well understood, the research, planning and development of a long-term wildlife management plan will start almost immediately. Organizations such as the Saskatchewan Wildlife Federation, Ducks Unlimited Canada and the Saskatchewan Natural History Society will be asked to assist the Authority and Saskatchewan Parks, Recreation and Culture wherever possible. Land negotiations, planting of food and cover plots, and other tree plantations will be initiated quickly upon approval of the project.

As indicated in Table 15, the Authority will undertake mitigative and development initiatives totaling $2,100,000 as described above. In addition, long-term monitoring of inputs and additional baseline gathering will be undertaken at an estimated cost of $200,000. This long-term management of the wildlife resources will become the responsibility of the Authority or its successor, in cooperation with the other government departments, agencies and special interest groups. Until the form of such long-term management responsibilities are worked out with these groups, and the local municipalities, it is not possible to specify precisely the form it will take. The Souris Basin Development Authority's initial responsibility to construct the two dams and reservoirs may subsequently be amended, revised or expanded to give it a longer term mandate. Wildlife management could be only one of many future responsibilities of such an organization. The Authority has budgeted $375,000 over 10 years for the operation and maintenance of those wildlife mitigation measures referred to above (e.g. watering and cultivation, tree plantations, fence maintenance). A portion of these funds will also be used to supplement normal activities of other provincial government departments and agencies responsible for related delivery programs.

While the expected impact of the Rafferty project has been addressed in considerable detail, further baseline research and mitigative study is required before finalizing a wildlife mitigation plan of action for the Alameda reservoir. In 1987, additional work is being undertaken by the Authority in this area as well as in the reach of the Souris River between the dams and the U.S. Border. The Authority will address these areas in greater detail, as with the Rafferty Project Area, following completion of this additional research and baseline information. Saskatchewan Environment will be provided with this detailed mitigation plan of action when it is available.

APPENDIX I

WILDLIFE INFORMATION COLLECTION METHODOLOGIES

1. AMPHIBIANS AND REPTILES

The status of this group of organisms is based upon existing literature, no formal surveys were conducted although sightings coincidental with other survey work were recorded.

2. BIRDS

.1 Waterfowl Production

A ground-based reconnaissance was made of the Rafferty Reservoir Study Area prior to conducting any systematic survey for broods. Subsequently, the Souris River was arbitrarily divided into two reaches; above and below the Midale Dam. The two reaches are distinctly different in morphology. A third area, treated as a discrete unit, was Dead Lake, which forms a backwater off the Souris River in times of high water levels and is a separate lake retained by a water control structure in times of low water levels in the river. The initial survey was conducted on 17 July 1984 under conditions of light winds and clear skies.

Survey Procedure

In order to develop estimates of total brood production, several sample areas were selected in each reach where access and good visibility facilitated observations of the entire river channel for at least 100 m upstream and downstream. Systematic observations were made of these points. The length of river channel surveyed was estimated. All broods were identified as to species, numbers of ducklings, and the stage of growth according to the system of Gollop and Marshall (1954). This is a brood classification system based on three classes and seven subclasses of plumage development as indicators of age. Thus broods can be backdated to a probable hatching date. This tabular method of recording broods reduces the bias of duplication of observations when replicate surveys are conducted. It also permits an appraisal of duckling survival and mortality during the period from hatching of fledging. The numbers of broods observed was then extrapolated for each reach to provide an estimate of total brood production on each reach and then for the Project Area.

In addition to the systematic observations, opportunistic observations were recorded for broods seen in areas between the selected sampling sites. These data were used to provide a more accurate estimate of mean brood size for each class as well as a frequency distribution of those species encountered.

Production Estimates

Total estimated duckling production on the Study Area of the Souris River was calculated by extrapolating to the estimated total number of broods from systematic observations, for each brood class. Mean brood size, for each class was calculated from the combined results of systematic and opportunistic observations. Total estimated duckling production was then the product of mean brood size for each class times the number of broods for each class. Because of the different habitat above and below the Midale Dam, the above calculations were done separately for each reach, then totaled for the entire length of the Study Area.

Additional Observations

The waterfowl observed on Dead Lake were primarily adult male ducks although Double-crested Cormorants, American White Pelicans and Western Grebes were also observed. This suggests that Dead Lake functions more as a moulting area than for nesting and brood production. Brood surveys were therefore not conducted at that time but an estimate of total waterfowl numbers, and the proportional representation of various species was made from long range observations conducted at access points at each end of the lake.

During observations for broods, the presence and activities of other birds, mammals and reptiles was noted and recorded. Photographs were taken to provide a record of habitats and land use in the Project Area.

.2 Waterfowl Migration

Ducks and geese typically fly to nearby fields morning and evening to feed, passing the midday period on a large waterbody that affords them refuge from disturbance. Surveys were therefore conducted during the midday hours. Strategic observation areas were selected where binoculars and a spotting scope would facilitate a survey of the waterbody for ducks, geese and other migratory birds with minimum disturbance.

It is well known that duck and goose numbers peak in the Study Area about the second week of October (Bellrose, 1976), therefore the survey was scheduled for this period in order to assess the use of the Project Area by migrants.

Survey Procedure

Dead Lake and that marshy section of the Souris River which parallels the lake were surveyed on 10 and 11 October, 1984 from the high ridge which separates the two waterbodies. The total length of Dead Lake was walked in order to census the entire lake and as long a section of the river as possible. The remainder of the Souris River between Dead Lake and the Dr. Mainprize Regional Park was surveyed by vehicle. No survey of the river was conducted upstream of the park since the river is too narrow and the banks too steep to provide attractive resting areas for migratory waterfowl. Similarly, the river downstream from the Dead Lake weir was not surveyed because it provided unsuitable habitat: there was almost no water and the channel was choked with submerged and emergent vegetation.

.3 Upland Game Birds

Upland game birds data were derived from populations and hunting summaries in "Saskatchewan Game Management, 1983-84 and 1985-86" and supplemented by field surveys during spring 1985. Sharp-tailed Grouse were censured on their dancing grounds. Ring-necked Pheasants populations were estimated using the "crowing cock" technique. Results for both field surveys were recorded on standard Wildlife Branch memo sheets for Sharp-tailed Grouse and Ring-necked Pheasants.

Historical upland game bird data for the Moose Mountain Creek corridor does not exist. The Terrestrial Wildlife Habitat Inventory data for critical Sharp-tailed Grouse habitat was used in conjunction with dancing ground census information obtained from Saskatchewan Parks and Renewable Resources for other portions of Wildlife Management Zone 32 to estimate the Moose Mountain Creek population. Accurate population data is dependent on original field surveys. Historical data on Gray Partridge and Ring-necked Pheasant populations in the area is limited. Subjective evaluation of the habitat suitability and historical harvest data were used to rate the area for these two species.

.4 Raptors and Other Birds

Systematic surveys were not conducted for species other than waterfowl and upland game birds. Incidental field observations were recorded in order to supplement general information provided by Godfrey (1966), Richards and Fung (1969) and Salt and Salt (1976). The work of Blood et al. (1976), near Coronach, was also relevant to this study. Saskatchewan Parks, Recreation and Culture provided information on Ferruginous Hawk nesting sites in 1986.

3. MAMMALS

.1 Small Mammals

Systematic surveys were not conducted but evidence of their activities was noted during field surveys for other wildlife species. Basic information on species distribution was derived from existing references.

.2 Furbearers

Systematic surveys were not conducted but evidence of the activities of terrestrial and semi-aquatic furbearers was recorded during other wildlife surveys. Distribution data were derived from available references.

.3 Ungulates

Although late in the season, aerial deer surveys were conducted on 5 March 1985 using a fixed-wing aircraft to fly the Souris River Valley and its major tributaries from Weyburn to a point southeast of the proposed thermal plant at Shand. Optimum survey results would have involved a difficult winter with more than average snow depths. Mild winters in 1985-86 and 1986-87 have prevented this.

Survey results of previous surveys conducted by Saskatchewan Parks, Recreation and Culture were utilized wherever possible.

For the same reasons, systematic surveys were not conducted in the vicinity of the Alameda Reservoir. The value of the system to white-tailed deer was based on subjective evaluation of this habitat in relation to other similar habitats within the Wildlife Management Zone.

4. RARE, THREATENED OR ENDANGERED SPECIES

The very nature of this group of fauna makes general field surveys inadequate for defining the local status of a species or group of species. Therefore, historical data have been reviewed for indications of whether any species of wildlife, which is listed as rare, threatened or endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 1986) occurs or is likely to occur in the Rafferty or Alameda Project Areas.

5. HABITAT

Tamarack Environmental Services completed an aerial photography interpretation of cover types within the area anticipated to be impacted by the Rafferty Reservoir,up to the 552 m elevation. Detailed 1:5,000 topographic maps with one meter contour interval were utilized to plot cover by types, and area calculations were made by digital measurement of all habitat polygons within each quarter-section. Total habitat types were calculated by reach of the valley as well as for the entire Project Area. The habitat evaluation was based on literature and previous site visits.

The Saskatchewan Research Council undertook the natural vegetation evaluation as described in that section and Saskatchewan Parks, Recreation and Culture wildlife biologists updated the 1:250,000 Terrestrial Wildlife Habitat Mapping (Stelfox 1979) utilizing the 1:20,000 township photomaps, the 1:5,000 topographic maps of the Project Area, and the 1:50,000 National Topographic Series Maps.

APPENDIX II

TERMS OF REFERENCE FOR: 1987 HABITAT ASSESSMENT STUDIES DOWNSTREAM OF THE RAFFERTY AND ALAMEDA RESERVOIRS

1. INTRODUCTION AND OBJECTIVES

Impacts of the Alameda and Rafferty Reservoirs are acknowledged to occur not only within but downstream of those reservoirs as a result of altered flow regimes. At the same time, having control over water releases provides a substantial opportunity to enhance wildlife resources in the downstream portions of the affected river and creek valleys. In order to predict the impacts of flow alteration on a wildlife habitat, a quantitative description of the existing physical characteristics of existing habitat is required. The amount and quality of habitat for selected wildlife species can then be quantitatively described. The study will also be useful for providing insight into how the riverine habitat is being affected by existing flow regimes; future flows could thus be more intelligently managed to maintain or enhance those flow conditions.

The primary objective of the study will therefore be to document the amount and quality of habitat for selected wildlife species downstream of the two reservoirs prior to reservoir operation.

With this information in hand it will be possible to superimpose operational conditions on that habitat and thereby quantitatively describe the magnitude of wildlife habitat loss or gain.

2. APPROACH

.1 Introduction

Population-based and habitat-based data bases can each be used to assess existing environmental conditions prior to environmental perturbation (e.g., reservoir construction), with the utility of each being dependent upon factors such as: 1) Study Area size; 2) anticipated duration of impact (short or long-term); and 3) the wildlife species involved.

Population studies are designed to provide an indication of absolute numbers or densities within a given area. Impact assessment based on this approach involves a comparison of baseline population levels with those after environmental change. Nonetheless, several conditions must be met to ensure that such an approach is valid:

1. Abundance estimates must be accurate and precise to be certain that changes in wildlife species numbers are adequately detected. All sampling techniques for determining animal abundance are prone to biases or inaccuracies, particularly for animals with clumped distributions or which are difficult to see. To improve on accuracy and reliability requires increasing sampling intensity with a concommitant large increase in cost.
2. During the duration of an impact assessment study, factors other than the environmental perturbation in question should not contribute to changes in animal numbers. This condition can be satisfied by studies spanning just a few months but beyond that, factors such as predation, disease and normal demographic cycles can dramatically affect population numbers.
3. The study should allow the significance of changes in wildlife numbers to be assessed on a regional scale. Assuming that the first two conditions are satisfied, an impact assessment based on animal numbers is still faced with evaluating the significance of any detected change. Reduced animal numbers within a Study Area following project development may indicate actual animal loss, with an associated loss of regional productivity, or a simple displacement of animals to habitats outside of the Study Area, with no loss of net productivity, or both. In any event, each of these scenarios must be assessed on a regional basis. Even animal deaths and resulting loss in productivity may be of negligible significance if regional productivity is altered only slightly. Securing adequate population data on a regional basis is both difficult and expensive, particularly in areas where few previous studies have ben conducted.

Summarizing, as other studies have demonstrated (e.g., Eccles et al. 1984) population studies for impact assessment are best suited for: 1) small Study Areas; 2) short term impacts (i.e., where natural population cycles are not likely to confound population changes associated with impacts); and 3) species which can be effectively censured, and for which good quality regional data over an adequate pre-development time period can be readily obtained. Generally, population studies also are appropriate for endangered or relatively rare species which are limited in numbers by factors other than habitat availability, and/or which demonstrate a high degree of fidelity to traditional ranges.

A habitat approach to impact assessment is based on a comparison of habitat values before and after ecological changes occur within an area, generally on a species-specific basis. It relies primarily on the quantification of broad habitat types and a knowledge of species/habitat relationships. Some data on species abundance and distribution are required but only as a means of determining the habitat preferences of the study species.

In general, accurate habitat data are less expensive to obtain than accurate population data, and are not highly time-specific. Regional information on habitat availability can also be gathered less expensively, largely from remotely-sensed data sources, allowing the significance of habitat loss within a localized Study Area to be evaluated in a regional sense. Summarizing, a habitat approach to impact assessment is ideally suited for: 1) large Study Areas; 2) long-term impacts; and 3) most species for which species/habitat relationships can be determined.

The area for the proposed study involves in excess of 150 km of river and creek valleys. It supports a complex mosaic of vegetation communities, which vary in type and extent both within and between biophysical units. The majority of the indigenous fauna of the area has received little research attention to date, resulting in a paucity of population data for most of the species present. These factors, coupled with the long-term nature of the proposed project's potential impacts, greatly reduces the suitability of population studies as a means of providing baseline and post-impact wildlife information. Consequently, the study will concentrate on evaluating the current quality and quantity of wildlife habitat within the study region. Some species abundance information will be collected but will be primarily used to determine species/habitat relationships for use in subsequent evaluations of habitat quality.

.2 Habitat Evaluation Procedures (HEP)

The habitat-based approach proposed for this study is known as Habitat Evaluation Procedures (HEP), and was developed by the U.S. Fish and Wildlife Service (USFWS) as a standardized method of quantifying wildlife habitats for use in impact assessments of proposed water and land resource development projects. In brief:

> "the method can be used to document the quantity of available habitat for selected wildlife species: The procedures provide information for two general types of wildlife habitat comparisons: (1) the relative value of different areas at the same point in time; and (2) the relative value of the same area at future points in time. By combining the two types of comparisons, the impact of proposed or anticipated land and water use changes on wildlife habitat can be quantified."
>
> (United States Fish and Wildlife Service 1980a)

The rationale for a habitat-based approach to impact assessment is presented as follows:

> "Numbers of species and numbers of individuals often may change for unpredictable reasons but habitat potential remains unchanged. Because of its relative stability, it is this habitat potential which should be documented by the wildlife manager interested in ecologically valid impact assessment."
>
> (United States Fish and Wildlife Service 1980b)

In spite of its relatively recent development, HEP has gained acceptance in both biological and engineering circles (e.g., U.S. Army Corps. of Engineers) and has been successfully utilized for baseline wildlife habitat assessments, trade-off analyses and compensation analyses on a number of large-scale reservoir and diversion development projects (e.g., Slave River Hydro Project, Alberta; Terror Lake Hydro Project, Alaska; Dickey Lincoln Hydro Project, Maine; evaluation of potential dam sites for Dan River Hydro Project, New England; Anderson Ranch Dam, Black Canyon Dam, and Boise Diversion Projects, Idaho).

The HEP procedure is based on the assumption that certain measurable variables within any habitat type (e.g., percent tree or shrub canopy closure, age and composition of forest stand) are strongly correlated to that habitat's ability to support a given wildlife species (i.e., carrying capacity). To assess a habitat's suitability for given species, variables considered ecologically significant to a given species must be selected, measured on-site, and their values compared to corresponding values in habitats supporting the wildlife species at or near maximum levels (i.e., optimum habitat conditions). The ratio of Study Area values to optimum values provides one with an assessment of habitat quality.

The HEP procedure requires the completion of eight basic steps, which include:

1. The selection of "evaluation" or study species. All species indigenous to the area of concern will not be studied as this would not be practical physically or from a cost perspective. Rather, species will be selected based on their importance from an ecological value (e.g., a species can represent the habitat requirements for several others in a floodplain forest), its political importance (e.g., it has high management concerns) and its economic importance (e.g., it has commercial value for hunting). The Authority has tentatively selected several species for study, these being white-tailed deer, Blue-winged teal, Sharp-tailed Grouse, western painted turtle/snapping turtle, Red-tailed Hawk, Baird's Sparrow and mink. The final selection of species will be done in consultation with provincial wildlife agency representatives plus those from the Saskatchewan Wildlife Federation and the Saskatchewan Natural History Society.
2. Delineation and quantification of homogeneous habitat types. Cover types have already been delineated and the areal extent of these will also be calculated. Some fine-tuning of those boundaries may be necessary based on the ground-truthing field work.
3. Determination and selection of measurable variables considered important for rating habitat suitability for each of the evaluation species. All wildlife require a balance of particular habitat conditions to ensure that the major life requisites of food and cover are available. Habitat suitability is typically governed by biophysical characteristics such as vegetation cover type, slope and topography. The HEP analysis will rely greatly on existing literature which describes what the best variables are for measuring habitat suitability. For example, deer are highly dependent upon tall shrub communities for a food source. Therefore a good variable to measure would be percent canopy of preferred browse shrubs. In general, each selected variable will meet the following criteria: a) it is clearly related to the capability of an area to support the species in question; b) there is a

basic understanding of the relationship of the variable to habitat suitability; c) the variable is practical to measure in the field or by remote sensing.

4. Field measurements of selected habitat variables. Once the habitat variables are selected, field staff will conduct on-site measurements in all of the cover types delineated. Physical information to be collected will include tree height, diameter, percent cover, percent canopy coverage, browse use, shoreline length and shoreline characteristics. Work will be conducted over an approximate two-week period in 1987.

5. Development of linear relationships between the selected habitat and habitat suitability for each of the wildlife species (Suitability Indices). Suitability Indices (SI's) are the tool for assigning a suitability rating factor to a given habitat type. They range from 0.0 to 1.0 and can be described mathematically as:

$$SI = \frac{\text{Study Area Habitat Conditions}}{\text{Optimal Habitat Conditions}}$$

SI values are developed for each habitat variable considered to influence habitat suitability and carrying capacity for a particular species. A suitability score of 1.0 is assigned to the variable's measurement corresponding to the maximum observed animal abundance. Other measurements of the same variable are assigned a suitability score equal to observed animal abundance at that measured value divided by maximum abundance.

For the habitat evaluation models to be developed, limited quantitative data on habitat relationships in the Study Area are currently available and thus information from research conducted in similar ecological areas will be utilized. Of course, any existing Study Area information will be used and this will be supplemented by limited population studies. Optimum habitat conditions will largely be derived from existing research literature but as information becomes available during the study, our definitions will be modified to better incorporate conditions within portions of the Study Area that are considered to be highly productive for each evaluation species.

6. Development of habitat evaluation models. Individual SI relationships and values will be developed for each variable and these will be combined to create an overall Habitat Suitability Index (HSI) for each habitat type. This process is the basis for creating habitat evaluation or HSI models for each species.

   Wildlife often have different habitat requirements based on season of the year but as one season generally represents the most important time of the year (e.g., winter for deer) and because the associated habitat can thus be considered the most important for that species' survival, the Authority will be assessing habitat availability only for those critical periods.

7. On-site (field) measurements of selected population parameters to "fine-tune" models. It is generally accepted that the way in which habitat factors influence habitat suitability for each species can vary slightly from one geographic region to another. Habitat models developed largely from research data should therefore be "fine-tuned" to more accurately reflect species-habitat relationships within the Study Area. The Authority is proposing limited-scale data collection for selected species. These data will not be collected to provide an estimate of regional population levels but will simply assist us in developing regional-specific species-habitat relationships.

   Approaches to collecting this information will include re-examination of existing survey information (i.e., for white-tailed deer and Sharp-tailed Grouse) and where that information is site-specific enough to assign animal locations to habitat type, the data will be utilized. To supplement this information, browse surveys will be conducted during the course of measuring habitat physical characteristics; this information will allow the Authority to quantitatively document habitat preferences for white-tailed deer.

   For Blue-winged Teal, turtles, Red-tailed Hawks and Baird's Sparrows and mink, the Authority will utilize information already collected during the spring 1987 fisheries studies, the spring 1987 Alameda baseline studies, investigations to be conducted and information collected during the ground-truthing component of this study. In all cases, the distribution and abundance of each evaluation species encountered will be related to habitat type.

8. Calculation of habitat availability (Habitat Units) in the Study Area. The basic measure of habitat availability using the HEP approach is the Habitat Unit (HU), a unitless measure reflecting both habitat quality and quantity. Total habitat availability in the Study Area for each species will be calculated based on the formula:

   HU's = the sum of all HSI values for each habitat
   type x surface area of those habitat types.

   HSI value derivation has been described above. The areal extent of each habitat type (polygon) will be determined by digital planimetry. Shoreline lengths will be calculated and multiplied by an as-yet-to-be determined width which reflects the extent of onshore activity by aquatic-oriented species.